SEDIMENT	Solid material, both mineral and organic, that is in suspension, being transported, or has been moved from its site of origin by air, water, gravity, or ice.
SEED TREE CUTTING	The removal in one cut of most of the mature trees from an area, leaving only a small number of desirable trees to provide seed for regeneration.
SEEDLING/ SAPLING	A size category for forest stands in which trees less than 5 in. in diameter are the predominant vegetation.
SELECTION CUTTING	The annual or periodic removal of trees as part of an uneven-age silvicultural system. Cutting can involve individual trees or small groups of trees to meet a predetermined goal of size and species composition in the remaining stand.
SEMIPRIMITIVE RECREATION SETTING	A classification on the recreation opportunity spectrum that characterizes a predominately natural or natural appearing environment of a moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but are subtle.
SENSITIVE SPECIES	Those plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations.
SEQUENTIAL BOUNDS	A set of constraints used in linear program models to establish the relationship of the quantity of an output to preceding and succeeding quantities of that output (e.g. the forage production in one time period cannot increase or decrease over ten percent from the forage production of the previous time period).
SERAL	A biotic community which is developmental; a transitory stage in an ecologic succession.
SERIOUS INJURY	As defined by the State of Idaho is sustained damage to a designated or protected beneficial use which is not socially or economically justified.
SHELTERWOOD CUTTING	The removal of a stand of trees through a series of cuttings designed to establish a new crop with seed and protection provided by a portion of the stand.
SILVICULTURAL EXAMINATION	The process used to gather the detailed in-place field data needed to determine management opportunities and direction for the timber resource within a small subdivision of a forest area such as a stand.
SILVICULTURAL SYSTEMS	A management process whereby forests are tended, harvested, and replaced, resulting in a Forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of Forest thereby produced.

SITE PREPARATION	A general term for a variety of activities that remove competing vegetation, slash, and other debris that may inhibit the reforestation effort.
SITE PRODUCTIVITY	Production capability of specific areas of land.
SLASH	The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning of trees.
SMALL GAME	Birds and small mammals normally hunted or trapped.
SNAG	A standing dead tree usually greater than 5 feet in height and 6 inches in diameter at breast height.
SOIL PRODUCTIVITY	The capacity of a soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.
SPECIAL-USE PERMIT	A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest land for some special purpose.
STAGNATION	A condition where plant growth is markedly reduced or even arrested through, e.g., competition, state of the soil, or disease.
STAND	A community of trees or other vegetative growth occupying a specific area and sufficiently uniform in composition (species), age, spatial arrangement, and conditions as to be distinguishable from the other growth on adjoining lands, so forming a silvicultural or management entity.
STANDARD AND GUIDELINE	An indication or outline of policy or conduct.
STIPULATIONS	Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to the lease at the discretion of the surface management agency to protect valuable surface resources and uses.
STOCKING	A measure of timber stand density as it relates to the optimum or desired density to achieve a given management objective.
STREAM ORDER	A measure of the position of a stream in the hierarchy of tributaries. (Stream as referenced here refers to perennial streams.) a. First-order streams are unbranched streams, that is they have no tributaries.

b. Second-order streams are formed by the confluence of two or more first-order streams. They are considered second-order until they join another second-order or larger stream.

c. Third-order streams are formed by the confluence of two or more second-order streams. They are considered third-order until they join another third-order or larger stream.

STREAM REACH — A length of stream channel generally uniform with respect to discharge and structure.

SUCCESSIONAL STAGE — A phase in the gradual supplanting of one community of plants by another.

SUITABILITY — The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

SUITABLE FOREST LAND — Forest land (as defined in CFR 219.3) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there is reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.14); and for which there is management direction that indicates that timber production is an appropriate use of that area.

SUPPRESSION (FIRE SUPPRESSION) — Any act taken to slow, stop, or extinguish a fire. Examples of suppression activities include fireline construction, back-firing, and application of water or chemical fire retardants.

SYSTEM ROADS — See Forest system road.

T

TARGET — A quantifiable output assigned to the Forest.

TEMPORARY ROAD — Those roads needed only for the purchaser or permittee's use. The Forest Service and the purchaser or permittee must agree to the location and clearing widths. Temporary roads are used for a single, short-term use, e.g to haul timber from landings to Forest development roads, access to build water developments, etc.

THERMAL COVER — Cover used by animals to ameliorate chilling effects of weather; for elk, a stand of coniferous trees 40 feet or taller with an average crown closure of 70 percent or more.

THREATENED AND ENDANGERED SPECIES	Any species, plant of animal, which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its' range. Threatened species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.
THRESHOLD	A point or level below which no significant adverse changes of stream stability, stream condition or habitat are expected and where natural recovery of the stream including fish habitat can occur within the limits that sediment loading will not affect or inhibit such recovery. Threshold is a condition of recovery for the no effect, high fishable, moderate fishable, low fishable; low fishable and minimum viable standards.
TIMBER	A general term for the major woody growth of vegetation in a forest area.
TIMBER BASE	The lands within the Forest that are suitable for timber production.
TIMBER PRODUCTION	The purposeful growing, tending, harvesting, and regeneration of rotational crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For purposes of Forest planning, timber production does not include production of fuelwood.
TIMBER STAND IMPROVEMENT (TSI)	All noncommercial intermediate cuttings and other treatments to improve composition, condition, and volume growth of a timber stand.
TRACTOR LOGGING	Any logging method which uses a tractor as a motive power for transporting logs from the stumps to a collecting point - whether by dragging or carrying the logs.
TRAILHEAD	The parking, signing, and other facilities available at the terminus of a trail.
TRANSITORY RANGE	Land that is suitable for grazing use for a period of time. For example, on particular disturbed lands, grass may cover the area for a period of time before being replaced by trees or shrubs not suitable for forage.
TREE OPENING	An opening in the Forest cover created by the application of even-aged silvicultural practices. The Northern Regional Guide established size limitations and guidelines to determine when cut areas are no longer considered openings.
TRESPASS	The act of going on another's land or property unlawfully.

U

UNDERSTORY — The trees and other woody species which grow under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

UNEVEN-AGED MANAGEMENT — The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

Individual Tree Selection Cutting - The removal of selected trees from specified size and age classes over the entire stand area in order to meet a predetermined goal of size or age distribution and species composition in the remaining stand.

Group Selection Cutting - The removal of small groups of trees to meet a predetermined goal of size distribution and species in the remaining stand.

UNREGULATED HARVEST — This harvest is not charged against the allowable sale quantity. It includes occasional volumes removed that were not recognized in calculations of the allowable sale quantity, such as cull or dead material and noncommercial species and products. It also includes all volume removed from unsuitable areas. Harvests from unsuitable areas will be programmed as needed to meet multiple use objectives other than timber production and for improvement of administrative sites.

UNSUITABLE TIMBER LAND — Lands not selected for timber production in Step II and III of the suitability analysis during the development of the Forest Plan due to (1) the multiple-use objectives for the alternative preclude timber production, (2) other management objectives for the alternative limit timber production activities to the point where management requirements set forth in 36 CFR 219.27 cannot be met and (3) the lands are not cost-efficient over the planning horizon in meeting forest objectives that include timber production. Land not appropriate for timber production shall be designated as unsuitable in the Forest Plan.

UTILITY CORRIDOR — See corridor.

UTILIZATION STANDARDS — Standards guiding the use and removal of timber. They are measured in terms of diameter at breast height (d.b.h.) and top of the tree inside the bark (top d.i.b.) and the percentages of "soundness" of the wood.

V

VEGETATION TREATMENT	Any activities undertaken to modify the existing condition of the vegetation.
VEGETATIVE HABITAT	Abgr/Clun - Abies Grandis/Clintonia Uniflora Grand Fir/Queencup Beadlily
	Abla/Clun - Abie Lasiocarpa/Clintonia Uniflora Subalpine Fir/Queencup Beadlily
	Abka/Mefe - Abies Lasiocarpa/Menziesia Ferruginea Subalpine Fir/Smooth Menziesia
	Abla/Xete - Abies Lasiocarpa/Xerophyllum Tenax Subalpine Fir/Common Beargrass
	Al/Rv - Alnus/Rubus Alder/Raspberry
	Bepa - Betula Papyrifera Paper Birch
	Fevi - Festuca Viridula Rough Fescue
	Psme/Phma - Pseudotsoga Menziesii/Physocarpus Maluaceous Douglas-Fir/Ninebark
	Thpl/Atfi - Thuja Plicata/Athyrium Felix-Femina Western Redcedar/Lady Fern
	Thpl/Clun - Thuja Plicata/Clintonia Uniflora Western Redcedar/Queencup Beadlily
	Thpl/Opho - Thuja Plicata/Oplapanax Horridum Western Redcedar/Devils Club
	Tsme/Luhi - Tsuga Mertnesia/Luzula Hitchcockii Mountain Hemlock/Woodrush
VIABLE POPULATION	A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population in the planning area.
VISITOR INFORMATION SERVICE (VIS) SITE	A site which provides interpretative information, (directional, historical, statistical) located at Forest historical sites, overlook sites, or special interest areas.
VISUAL QUALITY OBJECTIVE (VQO)	A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.

Preservation: In general, human activities are not detectable to the visitor.

Retention: Human activities are not evident to the casual Forest visitor.

Partial Retention: Human activities may be evident, but must remain subordinate to the characteristic landscape.

Modification: Human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middle-ground or background.

Maximum Modification: Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Enhancement: A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

Rehabilitation: A short-term management alternative used to restore landscapes containing undesirable visual impacts to a desired visual quality.

VISUAL RESOURCE — The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

WALLOW — A depression, pool of water, or wet area produced or utilized by elk or moose during the breeding season.

WATER TURBIDITY — A water measurement of suspended sediment affecting the clarity of the water.

WATER YIELD — The measured output of the Forest's streams.

WAY TRAIL — A trail maintained only as a marked route which may present difficult travel conditions requiring a moderate to high degree of skill to travel and presenting a challenge to the user. Generally a tread is not maintained, but may be present to varying degrees.

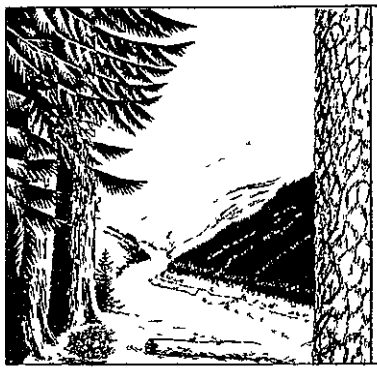
WET AREAS — Sites, often occurring at the heads of drainages, such as wet sedge meadows, bogs, or seeps. They are often referred to as "moist sites" and are very important components of elk summer

range. Sites near water are important because the forage they produce is highly nutritious and heavily utilized by elk.

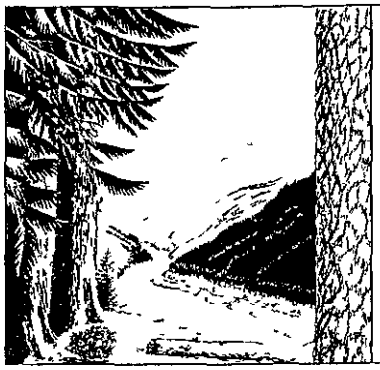
WETLANDS — Those areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

WILDERNESS — Federal land retaining its primeval character and influence without permanent improvements or human habitation as defined under the 1964 Wilderness Act. It is protected and managed so as to preserve its natural conditions which (1) generally appear to have been affected primarily by forces of nature with the imprint of man's activity substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and confined type of recreation; (3) has at least 5,000 acres or is of sufficient size to make practical its preservation, enjoyment, and use in an unimpaired condition, and (4) may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

WITHDRAWAL — An order removing specific land areas from availability for certain uses.



Appendices



Appendix A

Timber

APPENDIX A

TIMBER

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APPENDIX A

TIMBER

Table A-1. Timber Resource Land Suitability*

	Classification	M Acres Alternative K
1.	Nonforest Land (includes water)	24.4
2.	Forest Land	1812.7
3.	Forest Land Withdrawn from Timber Production	276.9
4.	Forest Land Not Producing Crops of Industrial Wood	147.8
5.	Forest Land Physically Not Suited/Irreversible Damage Likely to Occur/Not Restockable Within 5 yrs.	52.0
6.	Forest Land - Inadequate Info **	00.0
7.	Tentatively Suitable Forest Land (item 2 minus items 3,4,5, and 6)	1336.1
8.	Forest Land Not Appropriate for Timber Production ***	348.3
9.	Not Suited Forest Land **** (Item 3,4,5,6,and 8)	825.0
10.	Total Suitable Forest Land (Item 2 minus 9)	987.7
11.	Total Net National Forest Area (item 1 and 2)	1837.1

* Based on the potential biological growth of natural stands, with no consideration given to stocking control or other intensive management practices.

** Lands for which current information is inadequate to project responses to timber management.

*** Lands identified as not appropriate for timber production due to: (1) assignment to other resource uses to meet Forest Plan objectives; (2) assignment to other uses to meet management requirements; and (3) not cost efficient in meeting Forest Plan objectives over the planning horizon.

**** Lands identified as not suited for timber production are examined every ten years and analyzed through the land management planning process to determine their suitability for timber production.

VEGETATION MANAGEMENT PRACTICES

A. INTRODUCTION

All vegetative management practices will be preceded by a silvicultural examination and prescription. This process considers direction and objectives set forth in this Plan as well as specific factors such as site, soils, climate, and plant and animal species present. The prescription will detail the actual vegetative manipulation to be implemented on a case-by-case basis. An estimate of the acres of various types of vegetative management that will occur based on Forestwide assumptions used in the modeling process is shown in Table A-2 on page A-5. The actual acres treated may vary as a result of the site-specific silvicultural prescription.

The final decision for the vegetative management practice (silvicultural system) chosen for each vegetative type and circumstance shall be made by a certified silviculturist using guidance in this Appendix, a review of applicable technical and scientific literature, and practical experience. Using this knowledge, the silviculturist will evaluate the practices for relevance to the specific vegetation and site conditions.

For a complete discussion of the practices listed below and their environmental effects refer to Chapter IV of the EIS. See FSM 2471 for definitions of listed practices.

B. CLEARCUTTING

Clearcutting will be considered on the Douglas fir, grand fir-cedar-hemlock, and subalpine fir habitat types when the following conditions exist:

The existing regenerated stand is stocked with species that are not the desired species, or the physiological condition of the trees is such that natural regeneration is unlikely to occur.

The moisture and temperature of the site following clearing will be favorable for regenerating the desired species. In general, north and east aspects fit this category, but conditions can vary by geographic location.

Management objectives for the area can be better achieved by clearing all trees in one operation (i.e. wildlife habitat enhancement or timber production).

Clearcutting is most likely to be prescribed on the cool/moist habitat types of the grand fir habitat series.

C. SEED TREES

The seed tree system is normally used for the same reasons and on the same sites as clearcutting with the additional potential for achieving natural regeneration from the seed trees.

D. SHELTERWOOD

Shelterwood cutting will be considered on the DF, GF, C, H and AF habitat types when the following conditions exist:

The existing stand is stocked with species that are desired in the regenerated stand, and the physiological condition of the trees is such that seed production and successful regeneration are likely to occur.

The moisture and temperatures on the site are such that without some shading and cover, conditions will become too harsh for tree regeneration. South and west aspects generally fit into this category, but conditions can vary by location.

Management objectives for the area can best be achieved by maintaining some tree cover on the site until regeneration is established.

Shelterwood harvesting is most likely to be prescribed on the warmer/drier habitat types of the grand fir and the Douglas-fir habitat types.

In prescribing shelterwood harvest methods, consideration will be given to future harvests required. The feasibility of removing the residual overstory from an established stand of seedlings, effectiveness of site preparation/slash treatment, and options such as artificial shading shall be considered when prescribing shelterwood harvests.

E. SELECTION HARVESTS

Selection harvest systems will be considered on the grand fir, western redcedar, and hemlock habitat types when the following conditions exist:

The selection system will provide the most uniform continuous site occupancy by conifers of any of the other silvicultural systems. This is a desirable feature where visual, wildlife, and watershed needs suggest limited disturbance and maintenance of a high degree of canopy closure. The selection system may often be applicable to managing unique areas such as riparian zones.

This system can provide or maintain a mature forest character in areas where the condition is needed.

F. INTERMEDIATE HARVESTS

Intermediate harvests such as commercial thinnings will generally be prescribed only in stands that have not reached the culmination of mean annual increment. Salvage or sanitation harvests may be considered as intermediate treatments in stands that have already culminated in growth, but cannot be harvested and regenerated because of other resource constraints on scheduling (maintaining wildlife cover).

G. TIMBER STAND IMPROVEMENT

Precommercial thinning, cleaning, release and weeding treatments will be used on seedling/sapling sized stands where stocking exceeds the level necessary to meet the future stand objectives or where competition from shrub and herbaceous vegetation severely affects the survival and growth of conifer seedlings.

H. REFORESTATION

All cutover sites will be planned for regeneration. Hand planting will generally be prescribed for areas that have been clearcut. Hand planting may also be prescribed in shelterwood units when natural regeneration is unlikely or expected to be inadequate to meet required stocking levels, or species change is needed. Natural regeneration may be prescribed primarily in shelterwood units, where regeneration is likely to occur within five years.

For more specific criteria on silvicultural system selection, refer to the Northern Regional Guide, Management Standards and Guidelines, Timber, item 6 pages 2-7 to 2-14.

I. SITE PREPARATION

Alternate methods of site preparation including cultural, mechanical, manual, prescribed fire, biological, and chemical will be considered. The analysis will evaluate the effectiveness, specificity, environmental impacts, and benefit cost of the alternative in meeting management goals.

Table A-2. Vegetation Management Practices
(Average Annual in First Decade for Suitable Lands)

Practice	Acres
Regeneration Harvest:	11,193
Clearcut	5,287
Shelterwood and Seed Tree	
-Preparatory Cut	0
-Seed Cut	4,024
-Removal Cut	0
Selection	1,883
Reforestation of Nonstocked Lands	3,223
Intermediate Harvest:	
Commercial Thinning	0
Salvage/Sanitation	0
Timber Stand Improvement	1,928
Total Reforestation *	14,416

* Refers to natural and artificial regeneration and includes 11,193 acres of regeneration harvest plus 3,223 acres of reforestation of nonstocked areas.

Table A-3. Timber Productivity Classification

Potential Growth (cubic feet/acre/year)	Suitable Lands (acres)	Unsuitable Lands * (acres)
Less Than 20	9,679	7,685
20 - 49	1,247	4,126
59 - 84	45,930	100,945
95 - 119	245,168	270,713
120 - 164	443,717	354,719
165 - 224	233,273	105,136
225+	8,955	5,820
	987,971	849,145

* Productivity estimated for lands, such as wilderness, where data are not available.

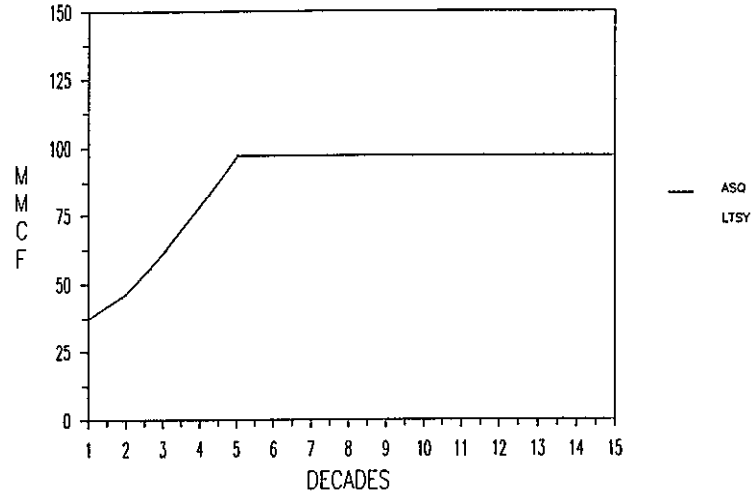
Table A-4. Age Class Distribution on Suitable Lands

Age Class	Acres (1985) Present Forest	Acres (2135) Future Forest
0 - 10	52,651	0
10 - 20	0	105,976
20 - 30	104,955	74,521
30 - 40	29,920	78,617
40 - 50	76,262	107,753
50 - 60	151,777	0
60 - 70	5,747	104,955
70 - 80	123,276	29,920
80 - 90	244	76,262
90 - 100	581	151,777
100 - 110	0	5,323
110 - 120	0	76,459
120 - 130	366,490	125
130 - 140	70,249	111
140 - 150	33,791	0
150 - 160	0	0
160 - 170	0	120,329
170 - 180	0	31,596
180 - 190	0	22,218
190 - 200	0	0
200+	0	0

Table A-5. Present and Future Forest Conditions

	Unit of Measure	Suitable Land	Unsuitable Land
Present Forest:			
Growing Stock	MMCF	3,197.7	2,124.9
	MMBF	14,117.9	8,859.8
Live Cull	MMCF	125.7	83.7
	MMBF	576.5	365.5
Salvable Dead	MMCF	5.0	3.3
	MMBF	22.7	14.4
Annual Net Growth	MMCF	65.6	12.3
	MMBF	283.8	208.0
Annual Mortality	MMCF	14.6	9.7
	MMBF	70.4	44.6
Future Forest (2135):			
Growing Stock	MMCF	3,863.3	
Annual Net Growth	MMCF	87.5	
Rotation Age	Years 80 to 160		

FIG. A-1. LONG TERM SUSTAINED YIELD AND ALLOWABLE SALE QUANTITY



Appendix B

Activity Schedules

APPENDIX B

ACTIVITY SCHEDULES

This Appendix includes activity schedules by management areas for various timber programs and road construction.

Activity schedules for other resources are shown in Table III-1 on page III-75 at the end of Chapter III.

In addition, timber sales and road construction are broken down further by District, fiscal year, amounts, and location. The programed timber sales and road construction proposals are shown on small scale maps and are available for inspection at the Supervisor's Office.

Table B-1 shows the proposed three-year timber sale program for fiscal years 1988, 1989 and 1990, and Table III-1 shows the possible average annual resource activities for the first and second decade (1998-2007).

The three-year timber sale program is a plan based on current conditions and information available at this time. The timber sale program may be modified during the implementation of the Forest Plan if conditions change or new information becomes available. The degree of the modification will determine whether or not the Forest Plan will need to be amended.

The volumes shown include both chargeable and noninterchangeable volumes from suitable lands. The noninterchangeable component of the volumes are estimated at this time and should not be viewed as fixed outputs that cannot be changed during the Plan period to reflect unforeseeable events or conditions. Fluctuations in the pulpwood market is one example of events that can have significant impacts on the volume of noninterchangeable material sold. Another is increases in insect activity or disease levels in localized areas. Some of the noninterchangeable volume estimate appears under the heading of small sales in the ten-year sale program. Depending on pulpwood market conditions, some of this volume may actually become the other timber sales that are scheduled.

The acres of harvest listed with the small sale programs is an estimate of the acres that will have some type of regeneration or removal harvest method applied.

Table B-1. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1988			
Pierce Dist.						
Fan Creek II S35,T34N,R6E	E1	650	5.5	X	0	GF-DF CC
Austin Dollar S1,T34N,R6E	E1	1500	5.2	X	C-3.0	GF-C CC-OR
Sylvan French S19,T37N,R7E	E1	400	2.0	X	C-1.3	GF-DWP CC
Siberia Cr. S9,T35N,R6E	A6/E1	1450	4.0	X	C-2.4 R-3.1	GF-DF-C CC
Felix Cr. S12,T36N,R8E	E1/C8S	2400	9.5	X	C-2.4 R-1.7	GF-C-WP CC-SW
Orogrande Face S6,T37N,R7E	E1/C4	580	2.7	X	C-1.8 R-5.3	GF-WP CC
Molly Cr. S5,T33N,R6E	E1	950	4.5	X	C-0.3 R-0.9	GF-C OR-CC
Small Sales	E1		5.6			

See footnotes on page B-12.

Table B-1 cont. Forest Plan Implementation Schedule*

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1988 cont.			
Palouse Dist.						
Wagner Gulch S18,19,T42N, R1W,S24,T42N R2W	E1/M2	1300	2.6/.4	Y	0/0	GF-WP--CC --ITM
Butter and Eggs S28,33,34, T40N,R1W; S1,4,T39N, R1W; S25-27, 31-35,T40N, R1E; S4-7, T39N,R1E	E1,M2	3600	16.0/1.2	Y	10.7/3.0	GF-C--CC GF-C--OR DF-PP--SW DF-PP--ITM
Neva Hill S21-23,27, 28, T40N, R1E	E1,M2	1100	8.0/.8	Y	1.0/0	GF,C --CC
District Sales	E1,M2		2.5/.5	Y	0/0	All

See footnotes on page B-12.

Table B-1 cont. Forest Plan Implementation Schedule*

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1988 cont.			
North Fork District *****						
Elmer T39N,R5E T39N,R6E T40N,R6E	E1,C4,M2	285	4.1/0	X	0 / 3.7	GF CC
Gem-Jaw T40N,R8E T41N,R8E	E1,C4,M2,A4	275	6/1		.2 / 1.2	GF-C CC
Clean Sweep S8,9,16 & 17 T40N,R7E	E1,C4,M2	179	6/.2		.5 / 1.2	GF-C CC
Lower Salmon S 21,22,23, 26,27,34&35, T41N, R6E	C4,A4,M2	404	13.5/.5	X	4.0 / 0	GF-C CC
Dogwood S 8, 16 & 17 T40N, R11E	E1,M2	35	0/.2	X	0 / 0	WP SAL
Independence Seed Orchard S 28, T40N, R11E	E1	20	.1/0		0 / 0	L SW
Shaw Creek S 16, 20&21, T41N, R7E	C4,M2	40	.1/0	X	0 / 0	C SAL
Mush Saddle S5,6,7&8 T39N, R9E	C8S,M2	95	2/0	X	0 / 1.3	MH
Hawk S 22,23,24, 25, 26 & 27, T40N, R7E	E1,M2	200	1.4/0		0 / 4.7	GF CC

See footnotes on page B-12.

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1988 cont.			
Lochsa District						
Lowell S 29-33, T33N, R7E	C4	3220	10.3/.2	X	5.2 / .8	GF-DF CC/OR
Swan Creek S31, 32, T33N, R6E	C4	360	1.5/0	X	.3 / 1.2	GF-DF-C CC/OR
Powell District						
Deep Saddle T37N, R12E T36N, R12E	E1,C4	273	5.9/0.3	12/85	7.0 / 4.7	GF-DF-S-C PP--CC/LTM
Elk Meadows T38N, R16E T38N, R17E	E1	136	5.8/0.2	5/87	6.2 / 4.9	AF-S-LP DF--CC
District Sales	E1	250	3.0/1.0	1/87	----------	All

See footnotes on page B-12.

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
Fiscal Year 1989						
Pierce District						
Lookout Chawapiti S35 T35N, R6E	E1	1750	6.0	X	C-0.8	DF-GF-C CC
Brady-May S10, T35N, R6E	E1,A6	1400	6.0	5/87	C-1.7 R-0.9	GF-DF-C CC
Moosehorn Dollar S5,T35N,R7E	E1	1250	7.0	X	C-2.3	GF-C CC
Upper Orofino S12,T36N,R6E	E1	1700	9.0	X	C-6.5	GF-C CC
Opal Snow S21,T34N,R6E	E1	1270	4.0	6/87	C-2.8	GF-DF-L CC-OR
Small Sales	E1		7.0			

See footnotes on page B-12.

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1989 cont.			
Palouse District						
Upper Palouse S20-22,28,29 T42N, R1W	E1,M2	600	6.5/.8	Y	4.0 / 5.0	GF-C--CC
Strychnine Switch Back	E1,M2	5000	13.5/ 1.5	N	5.0 / 3.0	GF--CC GF-DF--OR
Nat Brown II	E1,M2	2100	3.0/.8	Y	4.0 / .3	GF-C--CC GF-C--OR
District Sales	E1,M2		5.0/.9	Y	0/0	All
North Fork District						
Cubcat T40N, R8E T40N, R9E	E1,M2	320	5.5/.5	X	0 / 8	GF CC
Upper Fix S 3,4,5,7,8, 9 & 16, T40N R10E	E1,C4,E3, M2	250	5.5/.1	X	6.4 / 0	MH-DF-AF-C CC
Supervisor Heli S 19,20&29, T40N, R8E	E1,C4,A4, M2	300	8/1		.2 / 2.5	GF-C CC
Aquarius Station S 4,5,6&7, T40N, R7E	E1,C4,M2, A4	300	9/.5		4.5 / 3.4	GF-C CC
Flattail T39N, R5E T39N, R6E	E1,M2	270	5/0		1.5 / 2	GF CC

See footnotes on page B-12

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1989 cont.			
Lochsa District						
South Bend S4, 9, 10, T33N, R7E	C4,E1	1660	9.8/.2	X	5.5 / .2	GF-DF CC
Lookout S22-24, T34N, R7E	E1	980	5.7/.3	X	.4 / 0	GF-DF-C CC
Powell District						
P.O. Heli T36N, R12E	E1,C4	580	5.8/0.2	12/85	1.0 / 3.0	PP-DF-GF-C ITM/CC
Spring Creek T37N, R12E	E1	200	3.6/0.4	7/87	5.0 / 0.0	GF-DF-C-AF CC/LTM
Dist. Sales	E1	400	4.5/1.5	5/88	---------	All

See footnotes on page B-12

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
Fiscal Year 1990						
Pierce District						
62 Lunch S32,T34N,R7E S23,T34N,R7E	E1	1500	15.5	X	C-4.6	GF-C-DF CC
Sylvan Tamarack	E1	3100	13.0	X	C-7.3	GF-DF-WP CC
Cottonwood Encore S2 T37N R7E	E1	300	1.8	5/87	0	GF CC
Blue Fidelity S27 T37N R6E	E1	1050	3.0	X	R-2.0	DF-GF CC-OR
Small Sales	E1		5.7			
Palouse District						
Crane Creek S13,14,23,24 26,27,T43N, R4W	E1,M2	1500	3.5/.5	Y	4.0 / 3.0	GF-DF--CC-SW
Blakes Meadow S26,27,34,35 T43N, R3W	E1,M2	1200	3.3/.7	Y	4.0 / 2.0	L--CC,SW GF---CC
Mica Mtn. S34,35,T42N, R2W,S2-5,8-10,17,T41N, R2W	E1,M2	3500	7.0/1.0	Y	6.0 / 3.0	GF-DF--CC-SW
Potato Hill S23,24,26-29 32-34,T41N, R2W	E1, M2	5000	10.0/ 1.5	Y	9.0 / 10.5	GF-CC-SW
Dist. Sales	E1, M2		3.7/.8	Y	0 / 0	All

See footnotes on page B-12.

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1990 cont.			
North Fork District						
Upper Cool T40N, R9E T39N, R9E	E1,M2	250	5/0		5 / 2	MH CC
Dog Creek T41N, R6E T41N, R7E	E1, M2	205	6.2/0		2.3 / 1.7	GF-DF CC
Deception Gulch T40N, R10E T40N, R11E	E1, M2	105	3/0		2 / 5	GF CC
Barnyard S5,6,7,8,9& 17, T39N, R7E	E1,M2	250	6.2/.1		.2 / 3	GF-C CC
Sneak Sheep Heli S2,3,10,11, 13,14,15,23& 24,T40N,R7E	E1,C4,M2	250	6.5/1		6.8 / 2.6	GF-C CC
Lower Rock Heli S21,22,28&29 T40N R8E	C4,E1,M2, A4	170	4/1		0 / 0	GF-DF-C CC
Alder Fork S 23&26 T39N, R5E	E1,M2,A4	50	1/0		0 / 0	GF-DF CC
Small Sales No Specific areas defined	E1,C4,M2	100	.5/.5		0 / 0	GF-C-WP CC-SW-SAL

See footnotes on page B-12

Table B-1 cont. Forest Plan Implementation Schedule *

Timber Sales and Associated Roads **

Sale Name and Location	Management Area	Area (Acres)	Volume (MMBF) C/NIC ***	NEPA Analysis Complete	Road Miles Con/Recon	Probable Harvest Methods by Forest Type ****
			Fiscal Year 1990 cont.			
Lochsa District						
Bridge Creek S26,27,34, T33N, R6E	E1	1250	6.0/0		4.0 / 4.1	GF-DF CC-OR
U. W. Deadman S10,11,14, T34N, R7E	E1,C8S	1400	4.8/.2		3.0 / 1.0	GF-C CC
Mex Mountain S20,21,28,33 T35N, R7E	C8S	2460	4.9/.1		3.0 / 1.8	GF-C-DF CC-OR
Powell District						
Lost Creek T36N R10E	E1	170	3.0/0.0	6/87	1.8 / 2.0	AF-S-DF-LP CC
Brushy Creek T38N R15E	E1	270	5.5/0.5	7/87	0.0 / 0.0	AF-S-DF-LP CC/LTM
Gravey Creek T37N, R10E	E1	786	4.9/0.1	6/87	0.7 /40.5	AF-H-LP-L CC/LTM
Dist. Sales	E1	100	1.0/1.0	3/89	----------	All

* This is a Forest Plan Implementation Schedule and not a decision in the Forest Plan. It provides public information as required by Forest Service Manual 1922.5. This schedule is subject to updates based upon budget, market or other considerations. The public will be notified, at least annually, of changes to this Implementation Schedule.

** A minimum of three years of projects is listed in the schedule. The timber sales and associated roads schedule is updated periodically and as the first year is implemented, a new year is added, guided by the schedules of management practices in Chapter III of the Forest Plan. (See Tables III-1 and 2 in Chapter III.)

*** C/NIC - chargeable/noninterchangeable. The noninterchangeable component includes pulpwood, shakes, fence posts, green trees that do not meet minimum size or soundness requirements for sawlog utilization standards, and salvageable dead trees resulting from endemic insect and disease mortality on suitable lands only.

**** Explanation of Abbreviations

Tree Species

GF	Grand Fir	PP	Ponderosa Pine
AF	Subalpine Fir	DLP	Lodgepole Pine (Dead)
L	Western Larch	DWP	W. White Pine (Dead)
S	Engleman Spruce	DF	Douglas-Fir
LP	Lodgepole Pine	C	Western Red Cedar
WP	Western White Pine	MH	Mountain Hemlock

Harvesting Methods

CC	Clearcut	ITM	Individual Tree Mark
OR	Overstory Removal	LTM	Leave Tree Mark
SW	Shelterwood	SAL	Salvage

***** In 1985 most of the Kelly Creek District was combined with Canyon District and renamed the North Fork District. Small portions also went to the Powell and Pierce Districts.

Appendix C

Projected Budget

APPENDIX C

Table C-1. PROJECTED BUDGET

Average Annual Cost Required to Implement the Forest Plan By Activity
Decade 1 (thousands of dollars)

Funding Item	Budget Activity	1978 Dollars	1986* Dollars
00	General Administration	1407	2251
01	Fire Protection	569	910
02	Fire Protection (fuel)	163	261
03	Timber Sale Prep/Admin	1693	2709
04	Timber Resource Plans	191	306
05	Timber Silvicultural Exams	561	898
06	Range	68	109
07	Range (Noxious weeds)	19	30
08	Minerals	110	176
09	Recreation	679	1086
10	Wildlife and Fish	711	1138
11	Soil and Water	256	410
12	Maintenance of Facilities	315	504
13	Special Uses	59	94
15	Landownership Exchange	86	138
16	Landline Location	229	366
17	Road Maintenance	533	853
18	Trail Maintenance	282	451
19	Co-op Law Enforcement	44	70
20	Reforestation-Appropriated	1143	1829
21	TSI - Appropriated	268	429
23	Tree Improvement	39	62
26	KV - Reforestation	1766	2826
27	TSI - KV	55	88
28	Other - KV	380	608
29	Other - CWFS (Trust Fund)	432	691
30	Timb. Salv. Sales(Perm. Fund)	193	309
31	Brush Disposal (Perm. Fund)	1053	1685
32	Range Betterment	5	8
33	Construction - Rec. Facil.	55	88
34	Facility Construction - FA&O	366	586
35	Engineering Const. Support	1084	1734
36	Construction-Capital Invest.	1636	2618
37	Trail Construction/Reconst.	190	304
38	Timber Purchaser Road Construction/Reconst.	2900	4640
43	Land Acquisition	41	66
Total		19,581	31,331

* 1986 Value is 1.6 times 1978 value

This table represents an estimate by funding item to implement the Forest Plan. As implementation occurs the budget may change between funding items.

Appendix D

Fire Management

APPENDIX D

FIRE MANAGEMENT

I. INTRODUCTION

The Clearwater National Forest will provide fire protection and fire use necessary to maintain and enhance resource values while meeting the management goals and objectives.

Fire management is a support function integrated and responsive to the management direction established in this Forest Plan.

The National Fire Management Analysis System is a process used to integrate fire management planning to land and resource management. The fire management analysis identifies the most cost-efficient fire management program that meets land and resource management objectives. Information developed through this analysis is used in developing the Forest's annual budget request.

The analysis indicated the FY 1985 base as the most cost-efficient program. Figure D-1 on the following page illustrates the comparison between -30 percent, -20 percent, 1985 Base, and +20 percent funding levels. The reanalysis completed in 1986 indicated a fire fighting program (FFP) budget of $828.6 M (1985 base plus 30 percent) to be the most cost-efficient program.

The data base used in this analysis will be used for developing the annual fire management program for the Forest. Periodically the analysis will be updated to reflect current conditions. The annual fire management action program establishes and documents the fire program. The main objective is to achieve fire management direction in the most cost-effective manner.

All resource programs affected by fire will consider these basic concepts in the formulation of plans, decisions, and actions:

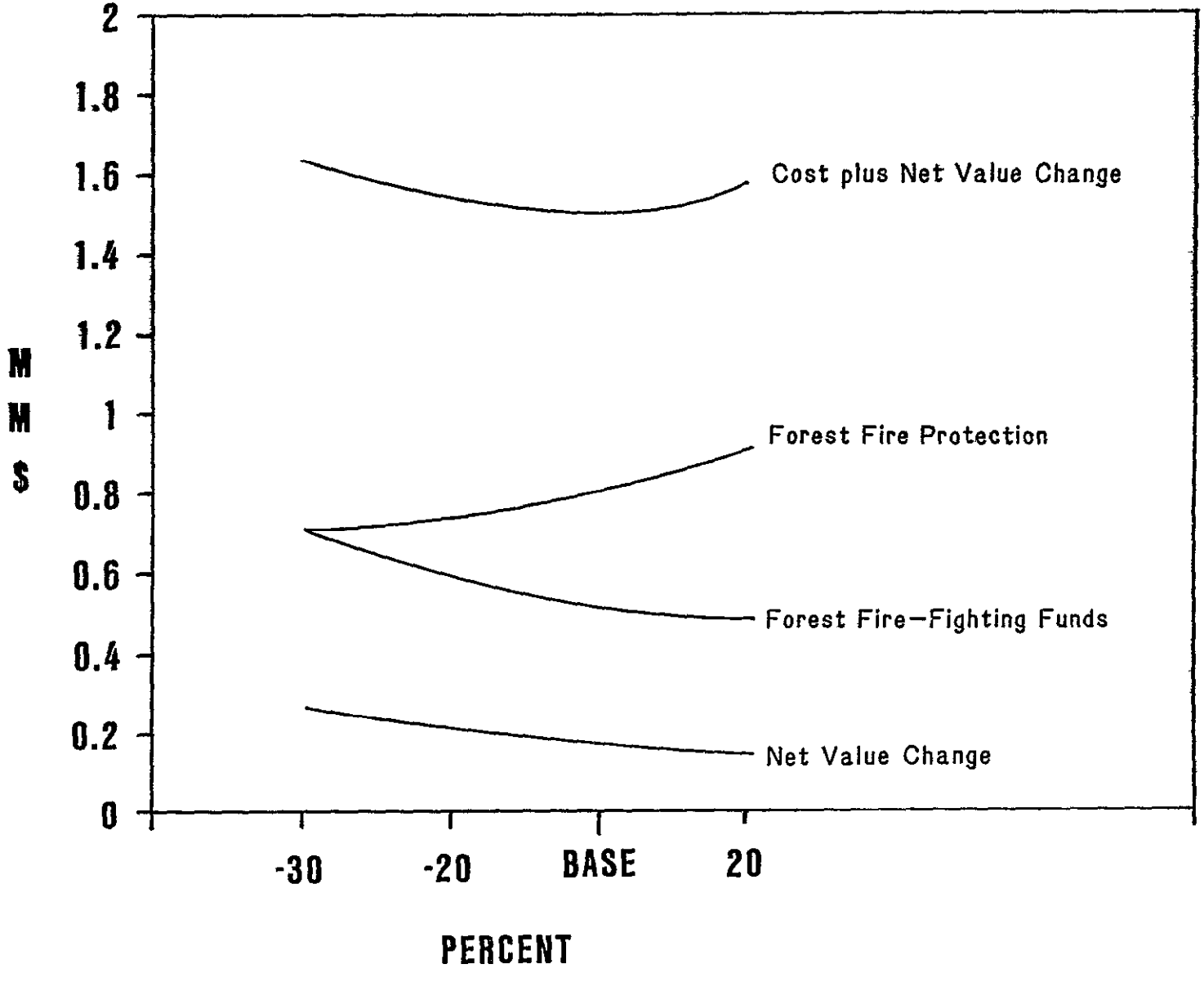
1. Fire has been an integral part of all ecosystems in Clearwater National Forest and the exclusion of fire from these ecosystems causes effects that may be undesirable.

2. As a result of fire protection, natural fuels in some areas have increased in amount and continuity to a hazardous level.

3. Prescribed fire from planned and unplanned ignitions can be used to achieve many land management objectives.

4. Permit fire in the wilderness to the maximum extent possible.

FIG. D-1. 1986 FIRE RE-ANALYSIS



II. FIRE MANAGEMENT DIRECTION

In addition to Forestwide and management area direction:

A. Reduce the cost of presuppression and suppression activities by integrating the total fire management program.

1. Manage activity and natural fuel loadings by reducing to acceptable levels through utilization, i.e., firewood, fuelwood.

2. Maintain aggressive fire suppression capability to support land management objectives and prescribed fire programs.

3. Be cost-conscious in presuppression and suppression activities when selecting the appropriate suppression response for wildfires.

B. Provide a continuous cadre of specialists with the knowledge and experience to accomplish the prescribed fire programs.

C. Prepare project plans for prescribed fires using planned ignitions to meet land management objectives. Funding for such projects will be by the benefiting function.

D. Develop an annual Fire Management Action Plan that will document the fire management program for that period. This plan will be controlled by the current approved budget.

E. Allow prescribed fire, both unplanned and planned ignitions, to achieve land management objectives. Each management area has written direction on where and when fire might be used. The Forest Fire Management Action Plan will contain flow charts showing how fire will be managed in each management area.

F. Collect sufficient funds from timber sales to treat activity fuel loadings created during each sale.

G. Assure that the appropriate suppression response is applied to each wildfire ignition. The following suppression strategies apply to wildfires:

Confine - To limit fire spread within a predetermined area principally by use of natural or preconstructed barriers or environmental conditions. Suppression action may be minimal and limited to surveillance under appropriate conditions.

Contain - To surround a fire and any spot fires with control line, as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions.

Control - To complete the control line around a fire, any spot fires, and any interior islands to be saved; burn out any unburned areas adjacent to the fire side of the control line; and cool down all hot spots that are immediate threats to the control line, until the line can reasonably be expected to hold under foreseeable conditions.

III. FIRE MANAGEMENT DEFINITIONS

Boundary Area - That area perpendicular to the established or proposed wilderness boundary that is defined by natural barriers.

Budget - The money determined to finance the fire program which includes prevention, detection, suppression, and fuels management.

Cost Plus Net Resource Value Change (C+NVC) - Cost includes both the fixed annual cost for the protection organization (annual fire program budget) and the variable suppression (emergency fire fighting) costs; NVC is the difference in value of planned resource outputs on an area before and after a fire.

Energy Release Component (ERC) - A number related to the available energy (BTU) per unit area (sq. ft.) within the flaming front at the head of a fire.

Fighting Forest Fires (FFF) - This budget appropriation is for the confinement and/or suppression of wildland fires on or threatening National Forest System Lands and for the emergency rehabilitation of watersheds damaged by the wildfire. FFF is an emergency appropriation and may not be preprogramed or budgeted in any way.

Fire Season - General fire season varies from year to year. Legal fire season is defined by specific dates. Fire season, which involves determining the appropriate suppression response, requires a method that allows consideration of weather, fuel, particle size, compaction, loading, etc. ERC provides charts and/or graphs which will allow specific conditions to be defined as a fire season.

(Fire season for Fuel Model 10 is considered to be at the 80th percentile while fire season for Fuel Model 8 is the 90th percentile ERC level. These percentile levels are obtained from representative historical weather data compiled by fire weather stations. Preseason is the time of year prior to fire season, usually spring, and below the 80th or 90th percentile. Post season is the time of year after the general fire season, usually fall, and below the 80th or 90th percentile.

Fuels - Combustible wildland vegetative materials. While usually applied to above-ground level and dead surface vegetation, this definition also includes roots and organic soils such as peat.

Natural Barrier - A break in the vegetation, i.e., rock outcrop, a stream, vegetative type change, or other natural occurrence within the vegetation that restricts the fire from spreading.

Natural Fuels - Fuels not directly generated or altered by management activity. This includes fuels which have accumulated over a period of time.

Net Value Change - (Also Net Resource Value Change) The sum of the changes in resource values on a land area that results from increases (benefits) and decreases (damages) in resource outputs as a consequence of fire.

Planned Ignition - A fire started by a scheduled, deliberate management action.

Prescribed Fire - A wildland fire burning under preplanned, specified conditions to accomplish specific planned objectives. It may result from either a planned or unplanned ignition.

Unplanned Ignition - A fire started at random by either natural or human causes, or a deliberate incendiary fire.

IV. MONITORING AND EVALUATION

Annually the Forest will document the results of monitoring and evaluating the implemented plan. Objectives of the Plan will be evaluated and the deviation measured from the expected costs and outputs of the fire management analysis process. The measurement and evaluation may differ due to the variations in the weather or other factors.

Providing the Plan is valid this variation should average out over time. The actual costs and outputs will approximate those obtained through the planning process, provided the results of the analysis process are valid.

V. SUMMARY OF FIRE MANAGEMENT DIRECTION

Table D-1 on the following page provides a summary of the fire management direction by management area for wildfires and prescribed fires. On page D-7 is an explanation of the terms used in the table.

Table D-1 *Fire Management Direction (Decade 1)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
			WILDFIRE					PRESCRIBED FIRE					
							PROBABLE (2)						
MGT AREA ID	(MAC)	PRIMARY RESOURCE EMPHASIS	STRATEGIES ALLOWED CONFINE	CONTAIN	CONTROL	MAX BURNED (ACRES)	LOSS FROM FIRE	NATURAL FUEL (ACRES)	MIH CODE	UNPLAN IGNIT	ACTIVITY FUEL (ACRES)	MIH CODE	PRIORITY
A2	8	REC	NO	NO	YES	0 1	H			NO			
A3	51 0	REC	YES	YES	YES	(3)	M	UNSCH	P12	YES			
A4	55 3	REC	YES (1)	YES (1)	YES	10	H	UNSCH	P12	YES	94	A01,P11	6
A5	1 8	REC	NO	NO	YES	0	H			NO			
A6	18 8	REC	YES (1)	YES (1)	YES	10	H	UNSCH	P12	YES	31	A01,P11	8
A7	23 6	REC	YES (1)	YES (1)	YES	(4)	H	300	P12	YES		CO2,P11 P12	4
B1	259 2	WLNS	YES	YES	YES	UNSCH	L	UNSCH	P12	YES			
B2	198 2	WLNS	YES	YES	YES	500	L	UNSCH	P12	YES			
C1	45 1	WLDF	YES	YES	YES	1000	L	UNSCH	P12	YES			
C3	34 4	WLDF	YES	YES	YES	100	L	1000	P12	YES		CO2,P12	2
C4	75 5	WLDF	YES	YES	YES	40	L	UNSCH	P12	YES	1,007	CO2,P11	3
C6	102 4	FISH	YES	YES	YES	(7)	H	UNSCH	P12	YES			
C8S	207 5	WLDF/TBR	YES	YES	YES	(5)	M-H	UNSCH	P12	YES	3,099	P11	7
E1	582 7	TBR	YES	YES	YES	(5)	M-H			NO	3,383	E04,P11	1
E3	13 0	TBR	YES	YES	YES	(5)	M-H	UNSCH	P12	YES	64	P11	10
M1	4 0	RNA	NO	NO	YES	0	H	UNSCH	P12	YES			
M2	127 4	RIP	YES	YES	YES	(6)	H	UNSCH	P12	YES	3516	P11	5
M5	105 3	UNSCH	YES	YES	YES	(6)	L	UNSCH	P12	YES			

*See explanation of headings on following page

(1) - Consistent with adjacent management areas

(2) - Fire loss is defined as those acres damaged sufficiently by wildfire to impair their ability to fulfill their management emphasis

(3) - A3 - Within Elizabeth Lakes area 30 acres or less Within other areas 100 acres or less

(4) - A7 - Within elk winter browse areas 40 acres or less Within timbered areas 1 acres or less

(5) - C8S, E1, E3 - Plantation etc, 1 acre or less Mature timber 40 acres or less Brush fields 500 acres or less

(6) - M2, M5, - Acreage dependent upon direction of adjacent management areas

(7) - C6 - Acreage dependent upon analysis of potential burn area

Table D-1 Explanations:

Major heading: WILDFIRE

Columns 1 & 2 - MGT. AREA - This is the Forest Plan management area (MA) designation and acres.

Column 3 - PRIMARY RESOURCE EMPHASIS - This is the primary resource emphasis of the MA taken from the MA Goal statement.

Columns 4-6 - SUPPRESSION STRATEGIES ALLOWED - See definitions on page D-3.

Column 7 - MAXIMUM BURNED ACRES - This is the maximum acres that would be allowed to burn per wildfire. These limits were established by an interdisciplinary team and relate closely to resource losses that would normally be tolerated in a particular management area and resource benefit that could be expected to be realized.

Column 8 - PROBABLE LOSS FROM FIRE - This is a subjective evaluation of the probable loss from a fire within a MA. Low means the loss would be minimal and high means a fire could do considerable amount of damage to the resource.

Major heading: PRESCRIBED FIRE

Columns 9 & 10 - NATURAL FUEL - Acres within MA acres that are expected to burn annually from unplanned ignitions. The appropriate Management Information Handbook Code (MIH) indicates the benefiting function.

Column 11 - UNPLANNED IGNITIONS - This states whether or not an unplanned ignition is allowed in a MA.

Columns 12 & 13 - ACTIVITY FUEL - These are the acres that will be created by management activity to be treated on an annual bases.

Column 14 - PRIORITY - This priority would determine the allocation of fuel treatment funds.

Appendix E

Land Ownership

APPENDIX E

LANDOWNERSHIP ADJUSTMENT

The Forest planning process defines the management direction for the Clearwater National Forest. The landownership planning process then identifies the landownership pattern which will attain the identified objectives. Based on the management direction and the desired landownership pattern, the landownership adjustment plan is developed. In conjunction with attaining an optimum landownership pattern, consideration will be given to settling land claims equitably and promptly.

The desired landownership pattern can be achieved through a variety of exchanges, purchase of fee land or of partial interests, and acceptance of donations to the United States. The landownership adjustment plan is a flexible plan which provides the opportunity to take advantage of changes in management direction and specific adjustment proposals.

The following criteria will be considered in the landownership adjustment process:

1. Land adjustments will be in conformance with law, regulations, policy, and management objectives identified in the Forest Plan.

2. In addition to basic adjustment authorities, consideration will be given to laws, regulations, policies, and management objectives relating to the following resources:

   a. Cultural resources.
   b. Wetlands.
   c. Floodplains.
   d. Threatened, endangered, or sensitive species and/or species habitat.
   e. Mining claims.
   f. Municipal watersheds.

3. Acquisition/retention of land within all Congressionally designated areas, e.g., Wild and Scenic River corridors and wilderness, will be in conformance with the direction cited in applicable laws.

4. Acquisition/disposal within other areas will be based on the merits of specific proposals.

5. Outstanding rights of third parties on Federal lands exchanged or non-Federal lands acquired will be protected or authorized as needed.

6. Reservations of rights, interests, and facilities will be made for protection and utilization of resources and for future management of Federal lands.

7. Federal lands on which the Forest has made considerable investment, e.g., in stand improvement and road systems, will be exchanged for highly desirable non-Federal lands. In some situations, the appraisal process does not provide

for the reflection of these investments.

8. Acquisition of lands or interests in lands will generally be on a willing-seller-willing-buyer basis. In Congressionally designated areas, where provided by applicable laws, imminent domain procedures may be used when irreparable damage to resources will occur.

Appendix F

Forest Travel Planning

APPENDIX F

FOREST TRAVEL PLANNING

I. INTRODUCTION

Travel planning includes all aspects of planning for travel on National Forest lands. It includes planned regulation of use on Forest roads, trails and areas to accomplish management objectives set forth in the Forest Plan.

The goals and standards stated in Chapters II and III of the Plan are supplemented by direction included in this appendix.

Direction for conducting travel planning is included in Forest Service Manuals 2300, 5300, 7100, and in this appendix.

II. FOREST TRAVEL PLAN

A. Public notification of travel regulations will be accomplished through the Forest Travel Plan which will include:

1. A Forest Visitors and Travel Plan Map prepared in accordance with FSM direction;

2. A published Forest Supervisor's Order prepared and posted for public information in accordance with 36 CFR part 261.

B. Travel regulations will be reviewed annually and the Forest Travel Plan revised as needed.

III. OFF-ROAD USE

A. Normally motor vehicles will be restricted when soil, vegetation, wildlife, or other resources may be damaged through such use. Use will be restricted for that season when damage would occur and permitted when no damage would be expected, such as, when snow-covered.

B. All motor vehicles would normally be prohibited by area closures in those areas being managed as a primitive or semiprimitive setting for nonmotorized recreation.

C. Use of motor vehicles with not more than two wheels on Forest development trails will be permitted except where:

1. Trails are located in areas designated to provide nonmotorized recreational settings.

2. Trails access areas designated to provide nonmotorized recreational settings and user conflicts would be anticipated, such as, those trails accessing the Selway-Bitterroot Wilderness.

3. Motorized use would endanger public safety.

4. Motorized use is or is expected to occur at levels which damage tread to the extent that normal annual maintenance work is not sufficient to prevent tread loss, and reconstruction is necessary to keep tread in an acceptable condition.

5. Motorized use is or is expected to occur at levels which result in harassment of wildlife or key wildlife habitats.

D. Use of motor vehicles with more than two wheels will not be permitted on Forest Development trails except where specifically permitted.

IV. ON-ROAD USE

A. Motor vehicle use on Forest Development roads will be permitted except where restriction of use is necessary for protection of Forest resources, public safety, or to accomplish Forest Plan goals and standards stated in Chapters II and III of the plan.

B. Non-street legal vehicles will not be permitted on Forest Development Roads open to normal traffic.

C. Restrictions of motor vehicles to accomplish elk habitat management goals will be arrived at in accordance with direction in Management Area C8S. (See Chapter III in this Forest Plan.)

D. Periods of restriction will be limited to those times necessary to accomplish objectives and will be standardized Forestwide to make regulations easily understood by the public. Standard restriction periods are as follows:

1. Areas managed for nonmotorized recreation use - YEARLONG TO ALL VEHICLES.

2. Areas subject to erosion and/or watershed damage - SEASONAL SEPT. 15 TO JUNE 15. Where conditions or levels of use by certain vehicles would not cause significant damage, such vehicles may be exempted from restrictions.

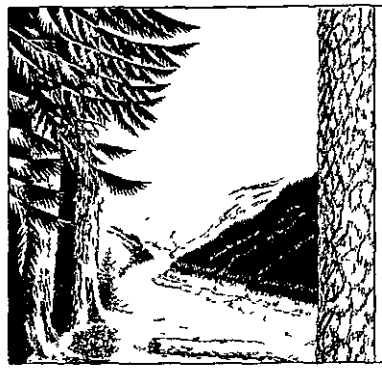
3. Key wildlife habitat - YEARLONG TO ALL VEHICLES. Where habitat is of seasonal importance, use will be constrained for only that period of time. For example, elk winter range: December 1 through May 15; elk calving: until July 15.

4. Areas of seasonal user conflict - seasonal restrictions as applicable.

E. Travel planning will be coordinated with adjacent landowners. Travel on National Forest lands will not be restricted to accomplish private landowner objectives unless:

1. Little demand for public use exists, and/or

2. No other means of restricting access to private lands exists.



Appendix G

Visual Travel Corridors

APPENDIX G

VISUAL TRAVEL CORRIDORS - Management Area A-4

Table G-1 shows the visual quality objectives as viewed from Management Area A-4. Management Area A-4 consists of land along both sides of selected travel corridors where timber harvest is permitted.

On page G-13 is an explanation of the tables in Appendix G.

Table G-1 * Visual Travel Corridors - Management Area A-4

Road/Trail Numbers	Name/Description	Miles	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Rd 6	Idaho State Highway	5 6	B	1	R	PR	PR	R	PR	M	Palouse
Rd 377	Palouse Divide(Bald Mt Junction To Rd 447)	8 0	B	2	PR	M	M	M	M	MM	Palouse
Rd 377	Palouse Divide(West Dennis to Bald Mt Junction)	9 0	B	2	PR	M	M	PR	M	MM	Palouse
Rd 4716	Skyline Drive	2 3	B	2	PR	M	M	PR	M	MM	Palouse
Rd 8	Idaho State Highway	2 1	B	2	PR	M	M	PR	M	MM	Palouse
Rd 1963	Park Road	1 4	B	2	PR	M	M	PR	M	MM	Palouse
Rd 3	Idaho State Highway	3 7	B	2	PR	M	M	PR	M	MM	Palouse
Rd 1452	Cloverleaf	1 4	B	1	R	PR	PR	R	PR	M	Palouse
Rd 382	Elk Creek	12 0	B	2	PR	M	M	PR	M	MM	Palouse
Rd 767	N Fork Palouse River	1 5	B	2	PR	M	M	PR	M	MM	Palouse
Tr 224	National Recreation Trail	1 0	B	1	R	PR	PR	R	PR	M	Palouse
Tr 224A	National Recreation Trail	1 0	B	1	R	PR	PR	R	PR	M	Palouse
Tr 224B	National Recreation Trail	0 8	B	1	R	PR	PR	R	PR	M	Palouse
Tr 228	National Recreation Trail	1.0	B	1	R	PR	PR	R	PR	M	Palouse
Tr 26	Three Tree Butte	3 5	B	2	PR	M	M	PR	M	MM	Palouse
Tr 221	Old Sampson Trail	3.2	B	2	PR	M	M	PR	M	MM	Palouse
Tr 228	Beason Meadows	6.5	B	2	PR	M	M	PR	M	MM	Palouse

* See explanation of table on page G-13

(Table G-1 cont)

Visual Travel Corridors - Management Area A-4

Road/Trail Numbers	Name/Description	Miles	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Tr 330	Sand Mountain	6 6	B	2	PR	M	M	PR	M	MM	Palouse
Tr 330A	Moose Creek Connection	0 5	B	2	PR	M	M	PR	M	MM	Palouse
Tr 319	Strychnine Ridge	0 6	B	2	PR	M	M	PR	M	MM	Palouse
Rd 247	Beaver Creek	8 1	B	2	PR	M	M	M	MM	MM	Canyon
Rd 247	Beaver Creek to Bungalow	23 2	B	1	R	PR	PR	PR	MM	MM	Canyon
Tr 95	Isabella Creek	1 0	B	1	R	PR	PR	R	PR	MM	Canyon
Tr 396	Black Mountain	5 6	B	1	R	PR	PR	R	MM	MM	Canyon
Tr 240	Smith Ridge	1 4	B	1	R	PR	PR	R	M	MM	Canyon
Tr 297	Aquarius - North Fork (RNA to Forest Boundary)	7 0	B	2	PR	M	M	PR	M	MM	Canyon
	Dworshak Reservoir	4 5	B	1	R	PR	PR	PR	M	MM	Canyon
Rd 250	Bungalow to Kelly Forks	19 0	B	2	PR	M	M	PR	M	M	Kelly Cr
Rd 250	Kelly Forks to Hidden Creek	10 0	A	2	PR	PR	PR	PR	M	M	Kelly Cr
Rd 250	Hidden Creek to Lake Creek Bridge	5 0	B	2	PR	M	M	PR	MM	MM	Kelly Cr
Rd 250	Lake Creek Bridge to Hoodoo Pass	13 0	B	2	PR	M	M	PR	M	MM	Kelly Cr
Rd 255	Kelly Forks to Moose Creek	11 0	A	1	R	R	R	R	R	R	Kelly Cr

(Table G-1 cont)

Visual Travel Corridors - Management Area A-4

Road/Trail Numbers	Name/Description	Miles	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Rd 581	Toboggan Road	30 0	B	2	PR	M	M	PR	M	M	Kelly Cr
Rd 720	Fly Hill	5 8	B	2	PR	M	M	PR	M	MM	Kelly Cr.
Rd 715	Pot Mountain Ridge	7 0	A	2	PR	PR	PR	R	MM	MM	Kelly Cr
Rd 295	Lake Creek	3 7	B	2	PR	M	M	PR	MM	MM	Kelly Cr
Tr 410	Goose Ridge	2 7	B	1	R	PR	PR	R	MM	MM	Kelly Cr
Tr 167	Bear Butte	12 0	B	1	R	PR	PR	PR	M	MM	Kelly Cr
Tr 164	12-Mile Saddle	1 5	B	1	R	PR	PR	PR	M	M	Kelly Cr
Tr 174	Upper Weitas	4 6	B	1	R	PR	PR	R	M	M	Kelly Cr
Tr 176	Flat Mountain	1 1	B	1	R	PR	PR	R	M	MM	Kelly Cr
Tr 373 1	Upper North Fork Clearwater	3 0	B	1	R	PR	PR	PR	MM	MM	Kelly Cr
Tr 532	Cayuse Creek	6 0	B	1	R	PR	PR	R	M	M	Kelly Cr
Tr 760	Little Moose Ridge	7 3	B	1	R	PR	PR	R	M	MM	Kelly Cr
Tr 20	Lower Weitas	10 4	B	2	PR	M	M	PR	M	M	Kelly Cr
Tr 649	Liz Butte	2 6	B	1	R	PR	PR	R	M	MM	Kelly Cr
Tr 738	State Line	4 0	A	1	R	R	R	R	M	MM	Kelly Cr
Tr 379	Vanderbilt Gulch	7 1	B	2	PR	M	M	PR	MM	MM	Kelly Cr.
+Rd 12	U S Highway (Forest Boundary to Powell)	74 3	A	1	R	R	R	R	PR	M	Lochsa, Powell

+ This section is actually within Management Area A7 and will be managed accordingly

(Table G-1 cont)

Visual Travel Corridors - Management Area A-4

Road/Trail Numbers	Name/Description	Miles	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
+Rd 12	U S Highway (Powell to Lolo Pass)	12 6	B	1	R	PR	PR	R	PR	M	Powell
Rd 369	Beaver Ridge	3 4	A	2	PR	PR	PR	R	M	M	Powell
Rd 362	Tom Beal (Upper)	1 5	A	1	R	R	R	R	PR	M	Powell
Rd 362	Tom Beal (Lower)	2 6	C	1	PR	PR	M	PR	M	M	Powell
Rd 111	Savage Ridge	4 0	B	1	R	PR	PR	PR	P	P	Powell
Rd 359	Colt Creek	5	B	1	R	PR	PR	PR	R	R	Powell
Tr 22	Rabbit Creek	1 2	B	1	R	PR	PR	R	R	R	Powell
Tr 49	Warm Springs Creek	3 3	B	1	R	PR	PR	R	M	M	Powell
Tr 46	Stock Bypass	1 5	B	1	R	PR	PR	PR	M	M	Powell
Tr 79	Sneakfoot	3 5	B	1	R	PR	PR	PR	M	M	Powell
Tr 50	White Sand Creek	11 5	B	1	R	PR	PR	R	PR	M	Powell
Tr 206	Eagle Mountain	3 8	B	1	R	PR	PR	R	M	M	Powell
Tr 469	Mocus Point	4 0	B	1	R	PR	PR	R	M	M	Powell
Rd 317	Coolwater Ridge	6 2	A	2	PR	PR	PR	R	PR	MM	Lochsa
Tr 224	Lower Fish Creek	13 1	B	1	R	PR	PR	R	M	M	Lochsa
Tr 234	Hungery Creek	1 5	B	1	R	PR	PR	R	M	M	Lochsa

+ National Forest lands in mixed ownership will be managed by rehabilitation until the adopted VQO's can be achieved
This section is actually within Management Area A7 and will be managed accordingly

VISUAL TRAVEL CORRIDORS - Management Area A-6

Table G-2 shows the visual quality objectives as viewed from Management Area A-6 which, although very similar to A-4, also has historical significance in regard to the Lewis and Clark Trail System which includes the Lewis and Clark Trail, the Lolo Trail, the Nee-Me-Poo, and the Lolo Motorway.

Table G-2 * Visual Travel Corridors - Management Area A-6

Road/Trail Numbers	Name/Description	Miles	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Tr 25	Lewis and Clark and Lolo	7 6	B	1	R	PR	PR	R	M	M	Pierce
Tr 40	Nee-Me-Poo	5 8	B	1	R	PR	PR	R	M	M	Pierce
Tr 104	Nee-Me-Poo	4 6	B	1	R	PR	PR	R	M	M	Pierce
Rd 500	Lolo Motorway	21 9	B	1	R	PR	PR	R	M	M	Pierce
Rd 500	Lolo Motorway	39 6	B	1	R	PR	PR	R	M	M	Kelly Cr Lochsa, Powell
+Rd 500	Lolo Motorway (Papoose Saddle to Highway 12)	2 7	B	1	R	PR	PR	PR	M	M	Powell
+Tr 56	Lewis & Clark	7 0	B	1	R	PR	PR	PR	M	M	Powell
+Tr 85	Lewis & Clark	6 0	B	1	R	PR	PR	PR	M	M	Powell
Tr 69	Lewis & Clark	9 3	B	1	R	PR	PR	R	M	M	Lochsa
Tr 237	Lewis & Clark	9 3	B	1	R	PR	PR	R	M	M	Lochsa
+Tr 256	Lewis & Clark (Gravey Creek)	10 5	B	1	R	PR	PR	PR	M	M	Powell

+ National Forest lands in mixed ownership will be managed by rehabilitation until the adopted VQO's can be achieved

* See explanation of table on page G-13

VISUAL TRAVEL CORRIDORS - Management Area A-5

Table G-3 shows the visual quality objectives within the foreground, middleground, and background as viewed from Management Area A-5 which includes administrative sites within the Forest and all developed recreational sites.

Table G-3 * Developed Sites - Management Area A5

Site Name	Site Kind	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Lolo	Campground	A	1	R	R	R	PR	M	MM	Pierce
Musselshell Meadows	Documentary	B	1	R	PR	PR	R	M	MM	Pierce
Musselshell Work Center	Administrative	B	1	R	PR	PR	PR	M	MM	Pierce
Weitas	Guard Station	A	1	R	R	R	PR	PR	PR	Pierce
Giant White Pine	Campground	B	1	R	PR	PR	R	PR	M	Palouse
Laird Park	Campground	B	1	R	PR	PR	R	PR	M	Palouse
Laird Park	Picnic Ground	B	1	R	PR	PR	R	PR	M	Palouse
Laird Park	Swimming	B	1	R	PR	PR	R	PR	M	Palouse
Little Boulder Creek	Campground	B	1	R	PR	PR	R	M	MM	Palouse
Little Boulder Creek	Picnic Ground	B	1	R	PR	PR	R	M	MM	Palouse
Aquarius	Campground	A	1	R	R	R	R	PR	PR	Canyon
Canyon Work Center	Administration	A	1	R	R	R	PR	M	M	Canyon
Isabella	Campground (proposed)	A	1	R	R	R	R	PR	PR	Canyon
Washington Creek	*Campground*	A	1	R	R	R	R	PR	PR	Canyon
Cedars	Campground	A	1	R	R	R	R	PR	PR	Kelly Creek
Hidden Creek	Campground	A	1	R	R	R	R	PR	M	Kelly Creek
Kelly Creek Station	Administration	A	1	R	R	R	R	R	R	Kelly Creek
Kelly Forks Station	Administration	A	1	R	R	R	R	R	R	Kelly Creek
Kelly Forks	Campground	A	1	R	R	R	R	R	R	Kelly Creek

* See explanation of table on page G-13

(Table G-3 cont) Developed Sites - Management Area A5

Site Name	Site Kind	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Noe Creek	Campground	A	1	R	R	R	R	PR	PR	Kelly Creek
Weitas	Campground	A	1	R	R	R	R	M	M	Kelly Creek
Apgar	Campground	A	1	R	R	R	R	PR	M	Lochsa
Glade Creek	Campground	A	1	R	R	R	R	PR	M	Lochsa
Knife Edge	Campground	A	1	R	R	R	R	PR	M	Lochsa
Lochsa Historic RS	Documentary	A	1	R	R	R	R	PR	M	Lochsa
Major Fenn	Picnic Ground	A	1	R	R	R	R	PR	M	Lochsa
Mex Mountain Work Center	Administration	B	1	R	PR	PR	PR	M	M	Lochsa
Nine Mile Nature Trail	Interpretive	A	1	R	R	R	R	PR	M	Lochsa
Nine Mile Rest Stop	Interpretive	A	1	R	R	R	R	PR	M	Lochsa
Three Devils	Picnic Ground	A	1	R	R	R	R	PR	M	Lochsa
Wild Goose	Campground	A	1	R	R	R	R	PR	M	Lochsa
Wilderness Gateway	Campground	A	1	R	R	R	R	PR	M	Lochsa
Colgate Lick	National Rec Trail	A	1	R	R	R	R	PR	M	Powell
Colt Creek Guard Station	Information	B	1	R	PR	PR	R	PR	PR	Powell
Devoto Grove	Documentary	A	1	R	R	R	R	PR	PR	Powell

(Table G-3 cont)

Developed Sites - Management Area A-5

Site Name	Site Kind	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Elk Summit VIS	Interpretive	B	1	R	PR	PR	PR	P	P	Powell
Jerry Johnson	Campground	A	1	R	R	R	R	PR	M	Powell
+Lochsa Lodge	Hotel, Lodge, Resort	A	1	R	R	R	PR	PR	M	Powell
+Lolo Pass	Winter Sports	A	1	R	R	R	R	M	M	Powell
+Lolo Pass	Interpretive	A	1	R	R	R	PR	PR	PR	Powell
Powell	Campground	A	1	R	R	R	R	PR	M	Powell
Powell	Information	A	1	R	R	R	PR	PR	M	Powell
Wendover	Campground	A	1	R	R	R	R	PR	M	Powell
Whitehouse	Campground	A	1	R	R	R	R	PR	M	Powell
+White Sand	Campground	A	1	R	R	R	PR	M	M	Powell
Austin Ridge	Lookout	B	3	M	M	M	M	M	MM	Pierce
Hemlock Butte	Lookout	B	3	M	M	M	M	M	MM	Pierce
Weitas	Lookout	A	1	R	R	R	PR	PR	MM	Pierce
Bald Mountain	Lookout	B	3	M	M	M	M	M	MM	Palouse
Black Mountain	Lookout	A	1	R	R	R	P	MM	MM	Canyon
Eagle Point	Lookout	A	3	PR	PR	PR	PR	MM	MM	Canyon

+ National Forest lands in mixed ownership will be managed by rehabilitation until the adopted VQO's can be achieved

(Table G-3 cont)

Developed Sites - Management Area A5

Site Name	Site Kind	Variety Class	Sensitivity Level	Initial VQO fg	Initial VQO mg	Initial VQO bg	Adopted VQO fg	Adopted VQO mg	Adopted VQO bg	District
Wallow Mountain	Lookout	A	2	PR	PR	PR	PR	MM	MM	Canyon
Junction Mountain	Lookout	A	1	R	R	R	R	PR	MM	Kelly Creek
Osier Ridge	Lookout	B	2	PR	M	M	PR	MM	MM	Kelly Creek
Castle Butte	Lookout	A	1	R	R	R	R	PR	M	Lochsa
Coolwater	Lookout	A	1	R	R	R	R	PR	MM	Lochsa (Nez Perce NF)
Bear Mountain	Lookout	B	1	R	PR	PR	R	PR	M	Powell
Beaver Ridge	Lookout	A	1	R	R	R	R	PR	M	Powell
+Rocky Point	Lookout	A	1	R	R	R	PR	M	M	Powell

+ National Forest lands in mixed ownership will be managed by rehabilitation until the adopted VQO's can be achieved

EXPLANATION OF TABLES G-1, 2, AND 3

Foreground (fg)	The detailed landscape within 0 to 1/4-1/2 mile from the viewer.
Middleground (mg)	The area from 1/4-1/2 to 3-5 miles from the viewer.
Background (bg)	The area from 3-5 miles to infinity from the viewer.
Retention(R)	A visual quality objective (VQO) which means man's activities are not evident to the casual forest visitor.
Partial Retention (pr)	A visual quality objective which, in general, means man's activities may be evident but must remain subordinate to the characteristic landscape.
Modification (m)	A visual quality objective which means man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. The activity should appear as a natural occurrence when viewed in foreground and middleground.
Maximum Modification (mm)	A visual quality objective which means man's activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.
Rehabilitation (reh)	A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.
Visual Quality Objectives (VQO's)	Desired levels or degrees of acceptable alteration of the characteristic landscape.
Initial Visual Quality Objectives (Initial VQO's)	Initial VQO's are based on variety classes and the sensitivity levels of the current situation.
Adopted Visual Quality Objectives (Adopted VQO's)	Adopted VQO's are statements of policy or management direction.

Appendix H

Old Growth and Snag Habitat Management

APPENDIX H

OLD-GROWTH AND SNAG HABITAT MANAGEMENT GUIDELINES

I. INTRODUCTION

Old-growth habitat is a vital component of the vegetative diversity of the Clearwater Forest. Old-growth habitat is vital to the perpetuation of old-growth dependent species of wildlife. In the Clearwater Forest, the pileated woodpecker and goshawk have been selected as indicator species to represent the quantity and quality of old-growth dependent animals.

II. OLD-GROWTH DEFINITION

Old-growth Forest is defined as "a stand that is past full maturity and showing decay; the later stages of Forest succession." Stands must meet most of the following requirements to be considered old growth:

1. 15 or more live trees per acre.
2. One or more snags per 2 acres over 21 inches d.b.h.
3. Two or more canopy levels, heart rot and other signs of stand decadence.
4. Overstory canopy closure of 10-40 percent.
5. Usually with a definite shrub-sapling layer of at least 15 feet tall with a canopy closure of over 40 percent.
6. With understory and overstory canopy combined, exceeding 70 percent.
7. With significant coarse woody debris, including snags (> 10/AC over 20 feet) and downed logs (> 20 ton/AC and snag and logs) (minimum 4/AC) that are large ($\geq$ 21 dbh) and > 50 feet long.
8. Live tree component of various species with wide range in sizes and age including long-lived seral dominants. More than 10 live trees/AC that are either old or have become large (> 21 dbh).

III. OLD-GROWTH HABITAT GUIDELINES

1. The 10 percent minimum old growth to be maintained may be found in wilderness, research natural areas, riparian areas, travel corridors, and areas identified as unsuitable for timber as well as areas suitable for timber harvests.

2. For purpose of achieving the 5 percent of each 10,000 acre minimum standard, timber compartments will be used as a basis of measurement.

3. The minimum size of an area that can be considered old growth is 25 acres. However, to insure optimum wildlife diversity and abundance, somewhat larger stands of approximately 80 acres are the preferred minimum. (Thomas 1979.)

4. In each 10,000 acre unit of suitable habitat, a 300 acre stand should be managed as old growth for pileated woodpeckers. It is recommended that the 300 acres be contiguous, but it is acceptable to divide the 300 acres into not more than three 100 acre areas as long as the areas are within 2 square miles.

5. The 300 acre area (or the three 100 acre areas) should be at least 200 yards wide at any one point. However, the remaining 200 acres (in the minimum 5 percent distribution unit) can be of any width but in not less than 25 acre units.

6. Old-growth stands should be distributed across the major habitat types found in the Forest in proportion to their occurrence.

7. For those 10,000 acre units without any old growth because of past fires or timber harvesting, select replacement stands.

8. Fire suppression/management strategies will be based on the objective of improving or enhancing old-growth values.

9. Existing old-growth stands may be harvested when there is more than 5 percent in an old-growth unit, and the Forest total is more than 10 percent, or a replacement stand becomes available.

10. A maximum of 200 contiguous areas of wilderness old growth may be used to meet the 500 acre old growth requirement per 10,000 acre old-growth analysis area.

IV. SNAG HABITAT DEFINITION *

1. Broken top.
2. 25" (+) dbh x for nest trees.
3. 18" (+) dbh x for food trees.
4. 70 percent bark cover especially on soft snags.
5. Preference for soft snags (grand fir).
6. Tree greater than 50 feet tall.
7. Feed trees are most often broken topped trees.
8. Live trees with broken tops/dead tops = 1 hard snag.

* Raphael G. Martin and Marshall White, "Use of Snags by Cavity Nesting Birds in Sierra, Nevada," Wild Monograph No. 86, January 1984.

V. SNAG HABITAT GUIDELINES

These recommendations are based on mean average of territory size, tree size, tree height, and tree density. The objective is to provide habitat for 40 percent of potential population of cavity dependent species.

1. Preferably manage snags in clumps. However, do not exclude consideration of single, scattered snags or replacement snags where needed within the harvest unit.

2. Average clump size is 5 acres. (Generally consisting of 20 soft snags and 80 hard snags per 5 acres or 20 trees per acre.)

3. Manage for one premium 5 acre patch per 500 acres. (It is anticipated that designated old-growth stands and some riparian areas will provide approximately one-half of the snag habitat requirements.)

References Cited

1. Franklin, J.F., "Characteristics of Old-Growth Douglas-Fir Forest in Challenges for Wildlife and Fish the Old-Growth Ecosystem as Managed," 1983.

2. Raphael G. Martin and Marshall White, "Use of Snags by Cavity Nesting Birds in Sierra, Nevada," Wild Monograph No. 86, January 1984.

3. Thomas, "Wildlife Habitat Management in the Blue Mountains," - USDA Forest Service, 1978.

4. Harger, Rosemary, "Old-Growth Forests: Managing for Wildlife," USDA Forest Service, Northern Region; December, 1979.

Appendix I

Scheduled Review of Mineral Withdrawals

APPENDIX I

SCHEDULED REVIEW OF MINERAL WITHDRAWAL

I. INTRODUCTION

The Federal Land Policy Management Act of 1976 requires that all existing and proposed mineral withdrawals be reviewed to determine: 1) whether existing withdrawals should remain withdrawn; and 2) whether proposed withdrawals should be withdrawn.

II. MINERAL WITHDRAWALS

Table I-1. Scheduled Review Of Existing Mineral Withdrawals

Serial No.	Name of Site	Township	Range	Acres	Scheduled Date Of Review
I011898	Powell Cpgd & Public Ser Site	37N	14E	60.00	1988
I011898	Cedar Grove Campground	37N	14E	20.00	1988
I011898	White Sands Campground	37N	14E	30.00	1988
I011898	Jerry Johnson Hot Springs	36N	13E	157.50	1985
I011898	Jerry Johnson Bar Campground	36N	12E	35.00	1985
I011898	Colgate Warm Springs Rec Area	36N	12E	22.50	1988
I011898	*Squaw Creek Campground	36N	13E	10.00	1985
I011898	Cold Creek Campground	36N	15E	15.00	1985
I011898	Old Colt Creek Campground	36N	15E	10.00	1985
I011898	Wendover Bar Campground	37N	13E	85.00	1985
I013935	Canyon RS Adm Site	40N	7E	40.10	1988
I013935	Aquarius Campground	40N	7E	35.87	1986
I013935	Weitas Guard Station	37N	8E	20.00	1986
I013935	Bungalow Ranger Station	38N	8E	50.00	1986
I013935	Sheep Mtn Work Center	30N	7E	10.00	1986
I013935	Kelly Forks Adm Site & Pasture	39N	10E	15.00	1988
I013935	Kelly Creek Ranger Station	39N	11E	30.00	1988
I013935	Apgar Campground	33N	7E	5.30	1984
I013935	Glade Campground	33N	7E	7.65	1984
I013935	Green Flat Campground	35N	10E	20.00	1984
I013935	Weitas Creek Campground	38N	8E	10.00	1986
I013935	Kelly Forks Campground	39N	10E	20.00	1986
I013935	Ruby Creek Campground	39N	11E	5.00	1986
I013935	Cayuse Rec Area & Landing Field	38N	11E	70.00	1986
I013935	Smith Creek Work Center	33N	6E	20.00	1984
I013935	Lochsa Work Center	35N	9E	30.00	1984
I013935	Kelly Forks Adm Site & Pasture	39N	9E	30.00	1988
I013935	Elk Summit WC & Pasture	34N	14E	20.00	1985
I013935	Elk Summit WC & Pasture	35N	14E	40.00	1985
I013935	Cold Springs Mill Site & Pond	39N	9E	42.50	1988
I013935	Noe Creek Campground	39N	9E	12.50	1986

Table I-1 cont. Scheduled Review Of Existing Mineral Withdrawals

Serial No.	Name of Site	Township	Range	Acres	Scheduled Date Of Review
I016893	Moscow Bar Campground	40N	8E	57.50	1986
I017100	Washington Creek Campground	39N	7E	21.64	1986
I017100	Hidden Creek Campground	40N	10E	27.50	1986
I017100	Wilderness Gateway Rec Area	35N	9E	215.00	1984
I017100	Clearwater Gulch Picnic Area	36N	6E	4.04	1986
I05884	Lochsa River Roadside Zone	37N	14E	230.00	1985
I05884	Lochsa River Roadside Zone	38N	15E	97.00	1985
I05884	Lochsa River Roadside Zone	32N	6E	255.00	1984
I05884	Lochsa River Roadside Zone	32N	7E	70.00	1984
I05884	Lochsa River Roadside Zone	33N	8E	291.00	1984
I05884	Lochsa River Roadside Zone	34N	8E	158.00	1984
I05884	Lochsa River Roadside Zone	34N	9E	170.00	1984
I05884	Lochsa River Roadside Zone	35N	10E	163.00	1984
I05884	Lochsa River Roadside Zone	36N	10E	182.00	1984
I05884	Lochsa River Roadside Zone	36N	11E	454.00	1985
I05884	Lochsa River Roadside Zone	36N	12E	472.00	1985
I05884	Lochsa River Roadside Zone	36N	13E	206.00	1985
I05884	Lochsa River Roadside Zone	37N	13E	218.00	1985
I05884	Lochsa River Roadside Zone	37N	15E	61.00	1985
I05884	Lochsa R Roadside Zone(PLO 1567)	33N	7E	291.00	1984
I05884	Lochsa R Roadside Zone(PLO 1650)	33N	7E	72.80	1984
I07058	Lochsa River Roadside Zone	35N	9E	290.40	1984
I07058	Lochsa River Roadside Zone	35N	10E	169.00	1984
I14880	N Fk Clearwater R Roadside Zone	41N	11E	240.00	1986
I14880	N Fk Clearwater R Roadside Zone	42N	11E	240.00	1986
I15448	Musselshell Ranger Station	35N	6E	80.00	1984
II5454	*Ohadi Ranger Station	42N	2W	40.00	1986
II5467	Cedars Adm Site	41N	11E	480.00	1986
II5471	Middle Fork Ranger Station	32N	6E	141.80	1984
II5473	*Big Stick Adm Site	43N	4W	120.00	1986
I15474	*Wolf Ranger Station	43N	3W	80.00	1986
I15475	Three Devils Ranger Station	32N	6E	76.50	1987
I15476	Pete King Bar Ranger Station	33N	7E	1.00	1984
I199	Soup Campsite	35N	8E	5.00	1984
I199	Cache Mountain Site	35N	8E	10.00	1984
I199	Hungery Campsite	35N	8E	20.00	1984
I199	Retreat Campsite	35N	8E	10.00	1984
I199	Indian Grave Site	36N	10E	10.00	1984
I199	Smoking Place Historical Site	36N	10E	37.50	1984
I199	Bald Mountain Historical Site	36N	10E	10.00	1984
I199	Bald Mountain Campsite	36N	10E	20.00	1984
I199	Elbow Bend Campsite	35N	7E	10.00	1984
I199	Horse Steak Mtn Campsite	35N	7E	10.00	1984
I199	Tom Beal Park	36N	14E	140.00	1985
I199	*Orogande Campground	37N	7E	156.59	1986
I199	Sinque Hole Campsite	37N	20E	10.00	1984
I199	Sherman Peak Historical Site	36N	9E	15.00	1984
I199	Indian Post Office Site	37N	12E	20.00	1985

Table I-1 cont. **Scheduled Review Of Existing Mineral Withdrawals**

Serial No.	Name of Site	Township	Range	Acres	Scheduled Date Of Review
I199	Lolo Pass Info Site	38N	15E	20.00	1985
I199	Dry Campsite	36N	9E	10.00	1984
I199	Spring Mountain Campsite	37N	12E	10.00	1985
I199	Lonesome Cove Campsite	37N	12E	10.00	1985
I199	Wendover Ridge Campsite	37N	13E	10.00	1985
I4799	High Mtn Lakes-Mallard Larkins	41N	7E	40.00	1989
I4799	High Mtn Lakes-Mallard Larkins	41N	8E	100.00	1989
I4799	High Mtn Lakes-Mallard Larkins	42N	7E	45.00	1989
I764	Moose City Graves	40N	11E	10.00	1986
I764	Jay Flat Campsite	37N	14E	312.50	1985
I764	Pete Ott Campsite	39N	10E	10.00	1986
I764	Isabella Campsite	41N	7E	30.00	1986
I764	Noseeum Campsite	36N	9E	20.00	1984
I764	Hotel Flat Campsite	36N	12E	102.50	1985
I764	Pinto Flat Campsite	36N	12E	65.00	1985
I764	Jay Flat Campsite	37N	13E	50.00	1985
I764	Fish Lake Campsite	40N	12E	132.84	1986
I764	Lake Creek Campsite	40N	12E	20.00	1986
I939	*Baldy Mountain Lookout	43N	2W	5.00	1986
I939	*Giant Whitepine Campground	42N	3W	20.00	1986

*Withdrawals on Palouse Ranger District administered by Clearwater NF.

Table I-2. **Proposed Withdrawals**
Lolo Trail, Lewis & Clark Trail, Nee-Me-Poo Trail

Serial No.	Name of Site	Township	Range	Acres	Scheduled Date Of Review
I016388	Dworshak Dam & Reservoir Proj	41N	5E	60.00	1989
I016388	Dworshak Dam & Reservoir Proj	41N	6E	1625.15	1989
I4410	Musselshell Camas Hist Site	35N	6E	242.50	1984
I5229	Elk Summit-Hoodoo Lake Area	34N	14E	50.00	1985
I5229	Elk Summit-Hoodoo Lake Area	35N	14E	51.76	1985
I5229	Powell RS Expansion Area	37N	14E	117.50	1985
	L&C Trail-Pheasant Camp	34N	6E	30.00	1988
	L&C Trail-L&C Grove	34N	6E	40.00	1988
	L&C Trail Pheasant Camp	34N	6E	30.00	1988
	L&C Trail Salmon Trout Camp	34N	7E	40.00	1988
	L&C Trail Small Prairie Camp	34N	6E	30.00	1988
	L&C Trail Full Stomach Camp	34,35N	7E	20.00	1988
	Nee-Me-Poo Howard Camp	37N	11E	20.00	1989
	L&C Trail 21 Mile Camp	38N	15E	20.00	1988

Table I-3. Totals of Mineral Withdrawals

	No. of Serialized Cases	No. of Sites	Acres
Existing Withdrawals	19	78	8,211.03
Proposed Withdrawals	3	4	2,146.91

Appendix J

Minerals

APPENDIX J

I. OIL AND GAS LEASING

Table J-1 lists recommended stipulations by management area.

Table J-1. Oil and Gas Lease Stipulations

Management Area	Environmental Factor	* Stipulation
A2	Dispersed Recreation (PRIM)	a, NSO, LSU,
A3	Dispersed Recreation (Motorized) (PRIM)	a, NSO, LSU,
A4	Travel Corridors (VIS-TM)	a, d, NSO
A5	Developed Sites	a, NSO
A6	Travel Corridors with Historic Values (VIS-TM)	a, d, h, NSO, LSU
A7	Recreation River (WSRVR)	a, aa, NSO, LSU, SOR
B1	Selway-Bitterroot Wilderness (WILNESS)	a, b, NSO
B2	Recommended Wilderness (WILNESS)	a, aa, LSU, NSO,
C1	Wildlife (SUMMER)	e, NSO, LSU
C3	Wildlife (WINTER)	e, j, k, NSO, LSU
C4	Wildlife (WTR-TM)	e, j, k, NSO, LSU
C6	Fisheries (PRIM)	c, f, I, NSO, SOR
C8S	Timber/Wildlife/Watershed (SUM-75)	e, f, LSU
E1	Timber Producing (TIMBER)	a, b, c, d
E3	Timber Producing (TM-AER)	a, b, c, d
M1	Research Natural Areas (RNA)	a, b, d, e, i, NSO
M2	Riparian Areas (RIP-TM)	a, c, d, e, i, NSO
M5	Nonforest and Noncommercial (PROD-4)	a, b, c, d, NSO, LSU
US	Marginal Timber Lands (MINLV)	a, b, c, d, NSO, LSU
**T & E	Threatened and Endangered Species	g, gg, J, L, NSO,

*See definitions of stipulation codes on page J-2.
** Not a management area. See definitions.

DEFINITIONS

Definitions for symbols used in the oil and gas leasing stipulation table are shown below. Small alphabetical symbols footnote mitigation opportunities shown stipulations, administrative procedures, etc.) that may be used to reduce the impacts.

(a) The aesthetic stipulation (Form ID-3100-29) will apply to all leases issued.

(aa) Proposed and existing scenic river systems can be protected with the No Surface Occupancy (NSO) or Surface Occupancy Restriction (SOR) by location stipulation (ID-3100-27).

(b) All operations will be within Federal and State air quality standards.

(c) Although all operations will comply with State and Federal water quality requirements, the construction of roads, pipelines, and other developments could require stream crossings that will produce some short-term sediment. Other water quality problems will be minimized or prevented with the use of the No Surface Occupancy (NSO) stipulation or the Surface Occupancy Restriction (SOR) stipulations (Form ID-3100-27).

(d) Activities on areas with limited reclamation will be prohibited or restricted with the use of NSO stipulation (Form ID-3100-27).

(e) Areas with high value for wildlife such as winter range, migration routes, and riparian habitats will be protected with the NSO or SOR stipulation (Form ID-3100-27).

(f) Important fishery streams will be protected with the SOR stipulation (Form ID-3100-27); however, the need to cross streams for roads and pipelines may produce some short-term effects on fishery habitats and food sources. This can be mitigated by requiring that activities be carried out during periods that are not critical to fish.

(g) The endangered and threatened species stipulation (Form ID-3100-29) will apply to all leases issued. Coordination measures identified in project-specific biological evaluations needed to minimize impacts upon T & E species or their habitat would apply in this alternative.

(gg) The endangered and threatened species stipulation (Form ID-3100-29) will apply to all leases issued. In addition, specific special stipulations, coordinating requirements, and guidelines which can control key habitat disturbances, restrict human access, and coordinate activity patterns are included. Coordination measures identified in project-specific biological evaluation needed to minimize impacts upon T & E species or their habitat would also apply.

(h) The cultural and paleontological resources stipulation (Form ID-3100-29) will apply to all leases issued.

Definitions (Cont.)

(i) All proposed activities involving floodplains and wetlands will require an environmental analysis meeting requirements of Executive Orders 11988 and 11990.

(j) Activity coordination stipulation (Form ID-3100-26) applies to control activities in time and space.

(k) All lease activities subject to site-specific environmental analysis are done by the BLM. Forest Service has opportunity to input mitigation at that time to protect surface resources.

(l) Leasing in identified threatened and endangered species habitat (grizzly bear) will be deferred until on-going studies determining acceptable use levels are completed.

(LSU) This stipulation is used to inform and alert a lessee to certain resource values, but before any specific mineral activity is proposed (ID 3100-28).

(NSO) The no surface occupancy stipulation (ID-3100-27) will be applied to protect surface resources.

(SOR) This stipulation specifically identifies a surface resource to be protected by restricting certain proposed mineral activities by location or timing. Also gives percent of lease affected by this stipulation (ID 3100-27).

II. ACTIVE MINERAL OPERATIONS

Table J-2. Active Mineral Operations
(Does not Include Small Recreational Type Suction Dredges)

Property Name D1	Operator	Location	Commodity	Reserves or Level of Activity
Lolo Association	Lucky 7 Mining Company	T35N, R6E Sec. 32 W1/2 E1/2	Gold (Placer)	Backhoe and med. size trommel
Hardrock Prospecting Permit I-18838	Guy Parke	T35N, R6E Portions of Sec.5,7-9,17, 18,20	Gold (Placer)	5" suction dredge
Little Cabin Little Thunder Big Rainey Claims	Guy Parke	T36N,R6E, Sec.34&35 T35N,R6E, Sec.4	Gold (Placer)	5" suction dredge
Lolo Placer #1	Great Continental Divide Corp	T35N,R6E, Sec.32, NW1/4 SE1/4	Gold (Placer)	Will start up 500 yd^3/day operation in spring 1985
April Creek	U.S.F.S.	T34N,R6E, Sec.5 NE1/4 SE1/4	Road Aggregate (Basalt)	5,000 - 10,000 yd^3
Dora Creek	U.S.F.S.	T34N,R6E, Sec.16,NE1/4 SW1/4	Road Aggregate (Basalt)	100,000 yd^3
Musselshell Quarry	U.S.F.S.	T37N,R6E, Sec.30,NE1/4 SW1/4	Road Aggregate (Basalt)	110,000 yd^3
Orogrande Cr.	U.S.F.S.	T37N,R7E, Sec.5,NE1/4 NW1/4	Road Aggregate (Basalt)	50,000 yd^3
Orogrande Cr.	U.S.F.S.	T37N,R7E, Sec.5, NW1/4 NW1/4	Road Aggregate (Gneiss)	38,000 yd^3
Larch Butte	U.S.F.S.	T37N,R7E, Sec.11, SE1/4 SE1/4	Road Aggregate (Gneiss)	91,000 yd^3
Orogrande Cr.	U.S.F.S.	T38N,R7E, Sec.33, SW1/4 SW 1/4	Road Aggregate (Gneiss)	200,000 yd^3

Table J-2 Cont. Active Mineral Operations
(Does Not Include Small Recreational Type Suction Dredges)

Property Name	Operator	Location	Commodity	Reserves or Level of Activity
D2				
Pastime 1&2	Samuel Gill	T42N,R1W Sec.31 NW1/4	Gold (Lode)	Opened up and exploring old adit
Gold Quartz #5	Gold Dust Mining John Hayden)	T42N,R1W Sec.31,SW1/4	Gold (Lode)	Opened up and exploring old adit
Grandpa's Claim	Ira Scott	T42N,R2W Sec.1, SE1/4 SW1/4	Gold (Placer)	Hand sluicing using 12' long sluice box
Hardrock Prospecting Perm. I-19494	Earl Casey	T39N,R3E, Sec.17 S1/2 SE1/4	Gold and Platinum Group Minerals (Lode)	Trenching and hand sampling
Bovill Pit	U.S.F.S.	T40N,R1W, Sec.1,NW1/4 NW1/4	Road Aggregate (Basalt)	50,000 yd^3
Top of the World	U.S.F.S.	T39N,R2E, Sec.3,NE1/4	Road Aggregate (Basalt)	203,000 yd^3
Clover Leaf	U.S.F.S.	T39N,R2E, Sec.8, SW1/4 SW1/4	Road Aggregate (Basalt)	17,000 yd^3
D3				
Sheep Mountain	U.S.F.S.	T40N,R7E, Sec.28, SW1/4 NW1/4	Road Aggregate (Granite)	150,000 yd^3
Golden Goose	Howard Wynn	T40N,R11E Sec.17 SE1/4 SW1/4	Gold (Placer)	Uses small shovel fed trommel
Dry Run and Easy Does It	Jim Yont	T40N,R11E, Sec.29,SW1/4 Sec.33 SW1/4	Gold (Placer)	5" dredge with backhoe & trommel
Mill-Mart #1-#6	Ray Miller & Harry Martin	T42N,R10E Sec.13,SW1/4 NW1/4, Sec.24 NW1/4	Gold (Placer)	3" suction dredge

Table J-2 Cont. Active Mineral Operations
(Does Not Include Small Recreational Type Suction Dredges)

D3 - (Cont.) Property Name	Operator	Location	Commodity	Reserves or Level of Activity
Laughing Bull	Hugo Marconi	T39N,R11E Sec.9,SE1/4	Gold (Placer)	3" suction dredge backhoe & sluice box
Isaiah 1&2 Elisha & Elijah Claims	John McInturff	T40N,R10E, Sec.24,NE1/4	Gold (Placer)	Backhoe & trommel
Cedars Oil and Gas Leases (Applications Pending)	John E. Dawson	T42N,R12E T42N,R10E T42N,R11E T41N,R12E T41N,R10E T41N,R11E	Oil and Gas	Applications pending, waiting for approved oil & gas E.A. (43,563 Acres)
Alma Mine	U.S.F.S.	T40N,R11E Sec.21 SW14 SW1/4	Road Aggregate (Quartzite)	10,000 yd^3
D5				
Quartz Mountain Lode	Terry Bunnel	T33N,R6E Sec.11, SW1/4	Gold, Silver	Has opened several old adits and is currently driving a new one.
Jungle Point	U.S.F.S.	T33N,R6E Sec.22, NE1/4	Road Aggregate (Basalt)	100,000 yd^3
D6				
Little Papoose Claims	Tom & Louise Larson	T34N,R13E Sec.6&7	Silver & Antimony	Trenching and drilling. Explored by several mining companies.
Powell Pasture	U.S.F.S.	T37N,R14E Sec.28 SW1/4 SE1/4	Road Aggregate Quartzite Diorite and Gneiss	10,000 yd^3
Brushy Fork	U.S.F.S.	T38N,R16E Sec.30, NE1/4 NW1/4	Road Aggregate (Quartzite)	500,000 yd^3

Table J-3. Outstanding and Reserved Mineral Rights

OUTSTANDING MINERAL RIGHTS

Location	Land Status	Mineral Status	Number of Acres and Interest
Palouse District			
T41N R1W			
Sec.6	FS	PVT	160.36 ac (3/4 Interest) (Outstanding)
T42N R1W			
Sec. 28	FS	PVT	120.00 ac (3/4 Interest) (Outstanding)
T42N R1E			
Sec. 14	FS	PVT	80.00 ac (1/2 Interest) (Outstanding)
T42N R1E			
Sec. 23	FS	PVT	40.00 ac (1/2 Interest) (Outstanding)
		TOTAL	400.36 ACRES

RESERVED MINERAL RIGHTS

Location	Land Status	Mineral Status	Number Acres and Interest
Pierce District			
T36N R6E			
Sec. 5	FS	PVT	61.50 ac
T37N R5E			
Sec. 3	FS	PVT	200.11 ac
Palouse District			
T39N R2E			
Sec. 3&4	FS	PVT	}
			}
T40N R1E			}
Sec. 17,18&22	FS	PVT	}
			} 64.88 ac
T40N R2E			}
Sec. 34	FS	PVT	}
			}
T40N R1W			}
Sec. 1	FS	PVT	}
T39N R3E			
Sec. 17	FS	PVT	120.00 ac

Table J-3 Cont. Outstanding and Reserved Mineral Rights

Location	Land Status	Mineral Status	Number of Acres and Interest
Palouse District (Cont.)			
T40N R1W			
Sec. 1	FS	PVT	92.49 ac
Sec. 2	FS	PVT	617.46 ac
Sec. 3	FS	PVT	587.00 ac
Sec. 10	FS	PVT	440.00 ac
Sec. 15	FS	PVT	320.00 ac
T41N R1E			
Sec. 17	FS	PVT	120.00 ac
T41N R2W			
Sec. 22	FS	PVT	40.00 ac
T41N R2W			
Sec. 27	FS	PVT	80.00 ac
T41N R3W			
Sec. 28	FS	PVT	160.00 ac
T41N R3W			
Sec. 29	FS	PVT	400.00 ac
T43N R3W			
Sec. 26	FS	PVT	40.00 ac
T43N R3W			
Sec. 27	FS	PVT	120.00 ac
		TOTAL	3,398.56 ACRES
Palouse District			
T43N R3W			
Sec. 18	PVT	US	215.16 ac
Sec. 19	PVT	US	200.00 ac
Sec. 20	PVT	US	360.00 ac
T43N R4W			
Sec. 24	PVT	US	160.00 ac
		TOTAL	935.16 ACRES

Table J-4. Mineral Occurrence and Potential for Development

Mineral or Commodity	Predicted 5-year Activity	Predicted 50-year Activity	Potential Capability Area Rating
Gold and Silver	Pd	Pd	Very High
Kyanite (aluminum oxide)	Dv	Pd	High
Antimony	Ex	Dv	Moderate
Base Metals (Cu, Pb, Zn, Mb)	Ex	Dv	Moderate
Oil and Gas	Pr	Pr	Low

EXPLANATION: 5 year and 50 Year Activity Forecast

Pd - Production is occurring or will occur.

Dv - Development of known deposits prior to production is occurring or will occur.

Ex - Exploration activities such as drilling, trenching, and minor road construction is occurring or will occur.

Pr - Prospecting generally using nonsurface disturbing geochemical or geophysical methods is occurring or will occur.

III. WITHDRAWAL REVIEW PLAN OF ACTION

A. FOREST MANAGEMENT TEAM

1. Develop criteria for making a decision on whether a withdrawal should be relinquished or retained.

2. Develop criteria for determining length of withdrawal period.

   a. Life of existing improvements or project or need. 20-30 years?

   b. Unique and rare undeveloped areas. 100 years? Indefinite?

3. Develop a justification statement as to why the area, facilities, etc., cannot be adequately protected by other means (existing regulations).

B. RANGERS

1. Preliminary Desk Review

   a. What sites are no longer needed, or not used for purpose withdrawn, or have low value or right-of-way type improvements and can be relinquished?

   b. What sites should be retained because of mineral activity, valuable improvements, etc.?

   c. What sites need further review on-the-ground.?

2. Provide Withdrawal Review Project Officer with the following information:

   a. List of sites to be relinquished.

   b. List of sites to be retained fully or in part depending on area occupied, along with the following which pertains to that site:

      (1) Value, type, and number of improvements. For example, 21 family units at $10,000 per unit, etc.

      (2) Visitor day use.

      (3) Other background information.

         (a) Opportunity for development of alternative sites.

         (b) Why the site or feature is rare and unique and needs protection.

         (c) Current and past history of mining in the canyon and general area.

   c. Site plan when available.

IV. WITHDRAWAL REVIEW CRITERIA

A. RELINQUISHMENT

1. All or part of the site is not being used for the purpose it was withdrawn.

2. Site contains R/W type improvements, such as roads, trails, pipelines, etc. (R/W can be reserved in mining patents.)

3. Low value improvements such as isolated cabins, unimproved or primitive campgrounds fences, or fenced enclosures (pasture).

4. High value improvements in unmineralized areas or areas where the risk of mining or losing the site to a mining patent is low.

   a. No mining claims in canyon.

   b. No history of mining.

   c. No one interested in having the area opened to mineral entry.

B. CONTINUING WITHDRAWAL

1. High value, major improvements on site such as an office or work center complex, developed recreational site where mining risk is moderate to high.

2. Unique and rare features in moderate to high risk mining area.

V. WITHDRAWAL REVIEW PROJECT OFFICER

A. Prepare withdrawal relinquishment documents. These will be signed off by the Forest Supervisor, and if desired, by each Ranger. Ranger could make a decision (one page document) or document in a letter to the Forest Supervisor that the withdrawals are not needed on these sites.

B. Prepare site rejustification documents.

C. Take pictures and gather other information as needed on each site. In most cases, an aerial photograph may be very helpful in showing how all the area to remain withdrawn is being used.

   1. Pictures of overall setting.

   2. Pictures of typical camping facilities.

   3. Pictures of typical features and facilities.

VI. PROPOSED REGIONAL WITHDRAWAL CRITERIA

A. RELINQUISHMENT

1. All or part of the site is not being used for the purpose for which it was withdrawn.

2. Site contains R/W type improvements, such as roads, trails, pipelines, etc. (R/W can be reserved in mining patents.)

3. Low value improvements such as isolated cabins, unimproved or primitive campgrounds, fences, or fenced enclosures (pasture).

4. High value improvements in unmineralized areas or areas where the risk of mining or losing a site to mining patent is low.

   a. No mining claims in the area.

   b. No history of mining.

   c. No one interested in having the area opened to mineral entry.

5. The land can be protected using other laws and regulations.

B. CONTINUE OR MODIFY WITHDRAWAL

1. High value, major improvements on site such as an office or work center complex, developed recreational site where mining risk is moderate to high. Period for withdrawal would be for life expectancy of use or 20 years maximum.

2. Unique or rare features, cultural resource sites and landmarks in moderate to high risk mining areas. Period for withdrawal would be indefinite or life term.

Appendix K

Water Resources

APPENDIX K

WATER RESOURCES

I. INTRODUCTION

This appendix is an elaboration of the Forestwide standards and is divided into three major sections:
- Section A is a list of water resource terms.

- Section B is water resource criteria.

- Section C is a list of specific stream systems and water quality criteria.

A. WATER RESOURCE TERMS

The following terms are used in the Forestwide standards under the "water" section and in this appendix.

1. **Beneficial Uses** — Any use(s) that is provided by the water resource. This can include such things as hydropower, irrigation, domestic use, fish habitat, etc. Fish habitat is the key beneficial use of the water in the Forest. Anadromous and resident fish are the two groups of fish included in the use.

2. **Best Management Practices** — Best management practices are defined in the glossary. They include but are not limited to:

   - "Idaho Forest Practices Rules"

   - "Rules and Regulations and Minimum Standards for Stream Channel Alternations"

   - Soil and Water Conservation Handbook (Forest Service Handbook 2509.22)

3. **Channel Type** — A broad class of stream-reach defined by physical characteristics that generally describe how sediment will pass through or collect in the channel.

   Type A: A relatively straight and steep reach (typically greater than 4 percent) that is usually structurally controlled with frequent low falls or cascades. This is a "high energy" segment.

   Type B: A moderate gradient (2 to 5 percent) reach that may be incised into depositional

material to some degree. The reach is partially confined by the adjacent slopes, but some degree of meandering may have developed. This is a "moderate energy" segment.

Type C: A low gradient reach (typically less than 3 percent) that is usually incised into alluvium. The reach is rarely confined and has well developed meanders and floodplains. This type channel is typical in meadows. This is a "low energy" segment.

3. **Full Biological Potential** — The actual potential of the habitat of a stream system or a specific reach within a stream system. It is a function of the physical characteristics of the stream and its watershed. Each system has its own inherent or natural potential.

4. **Threshold** — A point or level below which no significant adverse changes of stream stability, stream condition or habitat are expected and where natural recovery of the stream including fish habitat can occur within the limits that sediment loading will not affect or inhibit such recovery.

Threshold is a condition of recovery for all standards.

B. WATER RESOURCE CRITERIA

STANDARD	CRITERIA
Basic	Maximum temporary reduction of water quality for any specified beneficial uses. It must continue to maintain the stability, equilibrium, and function (physical and biologic) of a tributary stream as it relates to the beneficial uses of local, downstream, and parent stream. The water quality and stream conditions must be fully recoverable in time. This standard is applicable to all streams and may be supplemented by the standards listed below that apply to fish habitat. For individual projects, the beneficial uses must be identified, and the criteria to protect these uses must be specified.
No Effect	No sustained, measurable adverse changes over time due to management-caused effects on turbidity, temperature, substrate composition, and chemical quality; or physical loss or degradation of existing fish habitat potential (i.e., "threshold" levels of sediment should never be exceeded to meet this standard.)

STANDARD	CRITERIA

No Effect (continued)

The approximate maximum sediment loadings, expressed as increases (%) over natural sediment yields, that generally support this criteria are:

Channel type	Threshold
A	100%
B	45%
C	35%

High Fishable

Maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support an excellent fishery relative to the stream system's natural potential, and that will provide the capability for essentially full habitat recovery over time.

Maximum short-term sediment loading that is not likely to cause more than a 20 percent reduction from full biological potential of the habitat for the appropriate fish indicator species. Threshold levels of sediment should not be exceeded for more than 10 out of 30 years.

The approximate maximum sediment loadings that generally support this criteria are:

	Indicator Fish Species		
Channel type	steelhead	cutthroat	chinook salmon
A	110%	110%	105%
B	55%	55%	50%
C	50%	50%	45%

Moderate Fishable

Maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support at least a moderate harvestable surplus relative to the stream system's natural potential, and that will provide the capability for significant habitat recovery over time.

Maximum short-term sediment loading that is not likely to cause more than a 30 percent reduction from full biological potential of the habitat for the appropriate fish indicator species. Threshold levels of sediment should not be exceeded for more than 10 out of 30 years.

The approximate maximum sediment loadings that generally support this criteria are:

Channel type	steelhead	cutthroat	chinook salmon
A	175%	175%	125%
B	150%	150%	75%
C	75%	75%	50%

STANDARD	CRITERIA

Low Fishable

Maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support at least a minimal harvestable surplus relative to the stream's potential, and that will provide the capability for some significant habitat recovery over time.

Maximum short-term sediment loading that is not likely to cause more than a 47 percent reduction from full biological potential of the habitat for steelhead; or more than a 36 percent reduction from full biological potential of the habitat for cutthroat. Threshold levels of sediment should not be exceeded for more than 20 out of 30 years.

The approximate maximum sediment loadings that generally support this criteria are:

Channel type	steelhead	cutthroat
A	425%	250%
B	400%	225%
C	200%	125%

Minimum Viable

Maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support at least a viable fish population, and that will provide the capability for some significant habitat recovery over time.

Maximum short-term sediment loading that is not likely to cause more than a 66 percent reduction from full biological potential of the habitat for steelhead, or more than 48 percent reduction from full biological potential of the habitat for cutthroat. Threshold levels of sediment should not be exceeded for more than 20 out of 30 years.

The approximate maximum sediment loadings that generally support this criteria are:

Channel type	steelhead	cutthroat
A	700%	500%
B	650%	450%
C	350%	250%

C. LIST OF SPECIFIC STREAM SYSTEMS AND WATER QUALITY CRITERIA

The following are water quality criteria for watershed systems within the Clearwater River and the Palouse River in the Clearwater Forest.

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
PALOUSE R				
GOLD Cr	C	brook	minimum viable	20
JEROME Cr	C	brook	minimum viable	20
BOULDER Cr	C	brook	minimum viable	20
BIG Cr abv Olevan Cr	B	brook	minimum viable	20
MEADOW Cr	C	brook	minimum viable	20
BLAKES Fk	C	brook	minimum viable	20
EF MEADOW Cr	C	brook	minimum viable	20
MANNERING Cr	C	brook	minimum viable	20
WEPAH Cr	C	brook	minimum viable	20
PALOUSE R abv Laird Park	C	brook	minimum viable	20
STRYCHNINE Cr	B	brook	minimum viable	20
DRY Fk	B	brook	minimum viable	20
POORMAN Cr	B	brook	minimum viable	20
NF PALOUSE R	B	rainbow	low fish	20
WHITE PINE Gul	B	rainbow	minimum viable	20
MOUNTAIN Gul	B	rainbow	minimum viable	20
PALOUSE R abv NF PALOUSE R	B	rainbow	minimum viable	20
BIG SAND Cr	C	brook	minimum viable	20
LITTLE SAND Cr	C	brook	minimum viable	20
BONAMI Cr	B	brook	minimum viable	20
CLEARWATER R				
SELWAY R				
CEDAR Cr			no effect	
CEDAR Cr abv Forest boundary			no effect	
LOCHSA R to BRUSHY Fk	B	steelhead	no effect	0
PETE KING Cr blw WF PETE KING Cr)	B	steelhead	high fish	10
WF PETE KING Cr	B	steelhead	high fish	10
WALDE Cr	B	steelhead	high fish	10
PLACER Cr	A	steelhead	high fish	10
NUT Cr	A	steelhead	high fish	10
CANYON Cr	B	steelhead	high fish	10
SF CANYON Cr	A	steelhead	high fish	10
CANYON Cr abv SF CANYON Cr	B	cutthroat	high fish	10
MYSTERY Cr	B	cutthroat	high fish	10
CANYON Cr abv MYSTERY Cr	B	cutthroat	high fish	10

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
DEADMAN Cr blw MF DEADMAN Cr	B	steelhead	high fish	10
EF DEADMAN Cr	C	steelhead	high fish	10
WF DEADMAN Cr	B	steelhead	high fish	10
MF DEADMAN Cr blw falls	B	cutthroat	high fish	10
BIMERICK Cr	B	cutthroat	high fish	10
FISH Cr	B	steelhead	no effect	0
HUNGERY Cr blw OBIA Cr	B	steelhead	no effect	0
GASS Cr	A	steelhead	no effect	0
OBIA Cr	A	steelhead	no effect	0
DOUBT Cr	A	steelhead	no effect	0
HUNGERY Cr abv OBIA Cr	B	steelhead	no effect	0
WILLOW Cr	B	steelhead	no effect	0
FISH Cr abv HUNGERY Cr (blw Fish Cr Mdws)	C	steelhead	high fish	10
FRENCHMAN Cr	B	cutthroat	high fish	10
CAMEL Cr	C	cutthroat	high fish	10
SHERMAN Cr	B	steelhead	high fish	10
BALD MOUNTAIN Cr	A	cutthroat	high fish	10
HOLLY Cr	A	cutthroat	high fish	10
LOST Cr	A	cutthroat	high fish	10
INDIAN GRAVE Cr	C	steelhead	high fish	10
WF INDIAN GRAVE Cr	A	cutthroat	high fish	10
EF INDIAN GRAVE Cr	A	cutthroat	high fish	10
WEIR Cr	B	steelhead	high fish	10
POST OFFICE Cr	B	steelhead	high fish	10
EF POST OFFICE Cr	B	steelhead	high fish	10
WF POST OFFICE Cr	B	steelhead	high fish	10
SQUAW Cr	B	chinook	high fish	10
DOE Cr	B	steelhead	high fish	10
WF SQUAW Cr	B	cutthroat	high fish	10
EF SQUAW Cr	B	cutthroat	high fish	10
BADGER Cr	B	cutthroat	high fish	10
WENDOVER Cr	B	steelhead	high fish	10
PAPOOSE Cr	B	steelhead	high fish	10
WF PAPOOSE Cr	B	steelhead	high fish	10
EF PAPOOSE Cr	B	steelhead	high fish	10
PARACHUTE Cr	B	steelhead	high fish	10

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
CROOKED FORK abv BRUSHY FORK (blw Boulder Cr)				
	B	chinook	no effect	0
SHOTGUN Cr	B	steelhead	high fish	10
ROCK Cr	A	cutthroat	high fish	10
HASKELL Cr	A	cutthroat	high fish	10
CROOKED FORK abv BOULDER Cr	B	chinook	no effect	0
HOPEFUL Cr	B	steelhead	no effect	0
BOULDER Cr	B	steelhead	high fish	10
FOX Cr	A	steelhead	high fish	10
BRUSHY FORK blw SPRUCE Cr	C	chinook	no effect	0
PACK Cr	C	cutthroat	high fish	10
BRUSHY FORK abv SPRUCE Cr	C	cutthroat	high fish	10
SPRUCE Cr	C	steelhead	high fish	10
NF SPRUCE Cr	A	steelhead	high fish	10
SF SPRUCE Cr	C	steelhead	high fish	10
SHOOT Cr	A	cutthroat	high fish	10
TWIN Cr	B	steelhead	high fish	10
WHITE SAND Cr blw wilderness bdry	B	chinook	no effect	0
CABIN Cr	A	cutthroat	high fish	10
BEAVER Cr	A	cutthroat	high fish	10
CRAB Cr	A	steelhead	high fish	10
STORM Cr	B	cutthroat	no effect	0
WHITE SAND Cr abv BIG FLAT Cr	B	steelhead	no effect	0
BIG SAND Cr	B	cutthroat	no effect	0
SWAMP Cr	C	cutthroat	high fish	10
HOODOO Cr	C	cutthroat	high fish	10
COLT Cr	C	steelhead	high fish	10
RABBIT Cr	B	cutthroat	high fish	10
SAVAGE Cr	B	cutthroat	high fish	10
BIG FLAT Cr			no effect	
WALTON Cr	B	steelhead	high fish	10
CLIFF Cr	B	steelhead	high fish	10
JAY Cr	B	steelhead	high fish	10
ROBIN Cr	B	steelhead	high fish	10
EAGLE Cr	B	steelhead	high fish	10
WARMSPRINGS Cr	B	steelhead	high fish	10
COOPERATION Cr	B	cutthroat	high fish	10
LAKE Cr			no effect	
KINNIKINNICK Cr	A	cutthroat	no effect	0
SPONGE Cr			no effect	
INDIAN MEADOW Cr			no effect	
EAGLE MOUNTAIN Cr			no effect	
STANLEY Cr			no effect	

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
DUTCH Cr			no effect	
HARD Cr			no effect	
PASS Cr			no effect	
BOULDER Cr			no effect	
BIG STEW Cr			no effect	
OLD MAN Cr			no effect	
SPLIT Cr			no effect	
FIRE Cr			no effect	
COOLWATER Cr	A	steelhead	high fish	10
KERR Cr	B	cutthroat	high fish	10
GLADE Cr	B	steelhead	high fish	10
NOSEEUM Cr	A	steelhead	high fish	10
SKOOKUM Cr	A	steelhead	high fish	10
MF CLEARWATER R blw Lowell	C	steelhead	no effect	0
LITTLE SMITH Cr	B	cutthroat	high fish	10
BIG SMITH Cr	B	cutthroat	high fish	10
CLEARWATER R to MF CLEARWATER R				
OROFINO Cr abv Forest boundary	B	cutthroat	low fish	20
TRAPPER Cr	B	cutthroat	low fish	20
OROFINO Cr abv TRAPPER Cr	B	cutthroat	low fish	20
LOLO Cr abv Forest boundary (blw Yoosa Cr)	C	steelhead	high fish	10
MUSSELSHELL Cr	C	steelhead	high fish	10
GOLD Cr	B	cutthroat	moderate fish	10
MUSSELSHELL Cr abv GOLD Cr	B	cutthroat	moderate fish	10
LOLO Cr abv YOOSA Cr	B	cutthroat	high fish	10
YOOSA Cr	B	steelhead	high fish	10
CAMP Cr	B	steelhead	high fish	10
YOOSA Cr abv CAMP Cr	B	cutthroat	high fish	10
CHAMOOK Cr	B	cutthroat	high fish	10
MOX Cr	B	cutthroat	low fish	20
CHAMOOK Cr abv MOX Cr				
YAKUS Cr	B	cutthroat	high fish	10
YAKUS Cr abv RAT Cr	B	cutthroat	low fish	20
MUD Cr	B	cutthroat	moderate fish	10
ELDORADO Cr to DOLLAR Cr	C	steelhead	high fish	10
CEDAR Cr	B	cutthroat	moderate fish	10
ELDORADO Cr abv DOLLAR Cr	B	steelhead	high fish	10
AUSTIN Cr	B	steelhead	high fish	10
SIX BIT Cr	B	steelhead	high fish	10
DOLLAR Cr	B	steelhead	high fish	10
FOUR BIT Cr	B	steelhead	high fish	10
LUNCH Cr	C	steelhead	high fish	10
TROUT Cr	A	steelhead	high fish	10
FAN Cr	B	steelhead	high fish	10

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
POTLATCH River abv Forest boundary				
BIG BEAR Cr				
EF BIG BEAR Cr	C	rainbow	minimum viable	20
SCHWARTZ Cr	C	rainbow	minimum viable	20
CORRAL Cr	C	rainbow	minimum viable	20
LITTLE BOULDER Cr	B	rainbow	minimum viable	20
WF POTLATCH R abv Forest boundary	C	rainbow	minimum viable	20
FEATHER Cr	C	rainbow	minimum viable	20
COUGAR Cr	C	rainbow	minimum viable	20
TALAPUS Cr	B	rainbow	minimum viable	20
POTLATCH R abv WF POTLATCH R	C	rainbow	minimum viable	20
SHEEP Cr	C	rainbow	minimum viable	20
PORCUPINE Cr	C	rainbow	minimum viable	20
EF POTLATCH R	C	rainbow	minimum viable	20
RUBY Cr	B	rainbow	minimum viable	20
NF CLEARWATER R abv Aquarius	B	cutthroat	no effect	0
SKULL Cr blw COLLINS Cr	B	cutthroat	high fish	10
COLLINS Cr	B	cutthroat	no effect	0
SKULL Cr abv COLLINS Cr	B	cutthroat	high fish	10
QUARTZ Cr blw COUGAR Cr	B	cutthroat	high fish	10
QUARTZ Cr abv COUGAR Cr	B	cutthroat	high fish	10
SADDLE Cr	B	cutthroat	high fish	10
WOLF Cr	B	cutthroat	high fish	10
COUGAR Cr	A	cutthroat	moderate fish	10
GRIZZLY Cr	A	cutthroat	moderate fish	10
COLD SPRINGS Cr	A	cutthroat	high fish	10
COLD SPRINGS Cr abv COOL Cr	A	cutthroat	high fish	10
COOL Cr	A	cutthroat	high fish	10
PETE OTT Cr	A	cutthroat	high fish	10
ELIZABETH Cr	B	cutthroat	high fish	10
HIDDEN Cr	B	cutthroat	high fish	10
FIX Cr	A	cutthroat	high fish	10
DECEPTION Gul	B	cutthroat	low fish	20
COMET Cr	A	cutthroat	high fish	10
NF CLEARWATER R abv Cedars (blw Meadow Cr)	B	cutthroat	no effect	0
GRAVES Cr	B	cutthroat	high fish	10
MEADOW Cr	C	cutthroat	high fish	10
MEADOW Cr abv FLY Cr	C	cutthroat	high fish	10
VANDERBILT Cr blw CHAMBERLAIN Cr	B	cutthroat	high fish	10
CHAMBERLAIN Cr	B	cutthroat	high fish	10
VANDERBILT Cr abv FALL Cr	C	cutthroat	high fish	10
BOSTONIAN Cr	B	cutthroat	high fish	10

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
NIAGARA CR	B	cutthroat	high fish	10
BOUNDARY Cr	B	cutthroat	high fish	10
LONG Cr	B	cutthroat	high fish	10
SLATE Cr	B	cutthroat	high fish	10
SHORT Cr	A	cutthroat	high fish	10
LAKE Cr	B	cutthroat	high fish	10
GOOSE Cr	B	cutthroat	high fish	10
LAKE Cr abv SHELL Cr	B	cutthroat	high fish	10
LAKE Cr abv GOOSE Cr	B	cutthroat	high fish	10
KELLY Cr	B	cutthroat	no effect	0
JUNCTION Cr	A	cutthroat	high fish	10
BARNARD Cr	A	cutthroat	high fish	10
MOOSE Cr	C	cutthroat	high fish	10
OSIER Cr	B	cutthroat	high fish	10
OSIER Cr abv CHINA Cr	A	cutthroat	high fish	10
WF OSIER Cr	B	cutthroat	high fish	10
OSIER Cr abv WF OSIER Cr	B	cutthroat	moderate fish	10
CHINA Cr	A	cutthroat	high fish	10
LAUNDRY Cr	A	cutthroat	high fish	10
SWAMP Cr	B	cutthroat	high fish	10
SUGAR Cr	B	cutthroat	high fish	10
SWAMP Cr abv POLLOCK Cr	B	cutthroat	high fish	10
POLLOCK Cr	A	cutthroat	high fish	10
LITTLE MOOSE Cr	B	cutthroat	high fish	10
MOOSE Cr abv INDEPENDENCE Cr	B	cutthroat	high fish	10
DEADWOOD Cr	B	cutthroat	high fish	10
MOOSE Cr abv DEADWOOD Cr	B	cutthroat	high fish	10
KELLY Cr abv CAYUSE Cr			no effect	
CAYUSE Cr blw HOWARD Cr	C	cutthroat	no effect	0
TOBOGGAN Cr	B	cutthroat	high fish	10
MINK Cr	A	cutthroat	high fish	10
CAYUSE Cr abv MINK Cr	C	cutthroat	high fish	10
SILVER Cr	B	cutthroat	high fish	10
HOWARD Cr	B	cutthroat	no effect	0
GRAVEY Cr	B	cutthroat	high fish	10
MARTEN Cr	B	cutthroat	high fish	10
GRAVEY Cr abv MARTEN Cr	C	cutthroat	high fish	10
MIRE Cr	B	cutthroat	high fish	10
MONROE Cr	B	cutthroat	no effect	0
LOOKOUT Cr	B	cutthroat	no effect	0

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

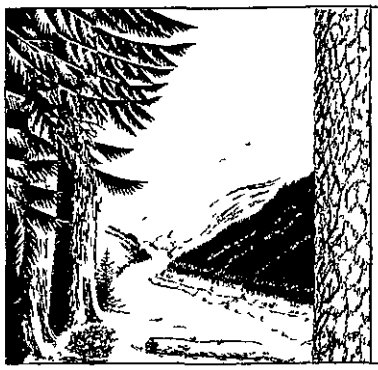
WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
FIELD Cr	A	cutthroat	high fish	10
LUNDE Cr	A	cutthroat	high fish	10
SPRUCE Cr	A	cutthroat	high fish	10
WEASEL Cr	B	cutthroat	high fish	10
POST Cr	B	cutthroat	high fish	10
FOURTH OF JULY Cr	A	cutthroat	high fish	10
CANYON Cr	A	cutthroat	high fish	10
BILL Cr	B	cutthroat	high fish	10
COOK Cr	B	cutthroat	high fish	10
COFFEE Cr	A	cutthroat	high fish	10
ADAMS Cr	A	cutthroat	high fish	10
SHOT Cr	A	cutthroat	high fish	10
WEITAS Cr blw WINDY Cr	B	cutthroat	no effect	0
JOHNNY Cr	A	cutthroat	high fish	10
DORIS Cr	B	cutthroat	high fish	10
WEITAS Cr abv LITTLE WEITAS Cr	B	cutthroat	no effect	0
LITTLE WEITAS Cr	B	cutthroat	high fish	10
MIDDLE Cr	B	cutthroat	moderate fish	10
ROCKY RIDGE Cr	B	cutthroat	moderate fish	10
FELIX Cr	A	cutthroat	high fish	10
BEAVER DAM Cr	B	cutthroat	high fish	10
SOLDIER MEADOWS Cr	B	cutthroat	high fish	10
HEMLOCK Cr	B	cutthroat	high fish	10
LARCH Cr	B	cutthroat	high fish	10
HEMLOCK Cr abv LARCH Cr	A	cutthroat	high fish	10
CABIN Cr	B	cutthroat	high fish	10
OROGRANDE Cr blw FRENCH Cr	B	cutthroat	low fish	20
PINE Cr	A	cutthroat	low fish	20
TAMARACK Cr	B	cutthroat	high fish	10
FRENCH Cr	B	cutthroat	low fish	20
EF FRENCH Cr	B	cutthroat	low fish	20
SYLVAN Cr	B	cutthroat	high fish	10
SYLVAN Cr abv HEM Cr	B	cutthroat	high fish	10
HEM Cr (incl JOY Cr)	B	cutthroat	high fish	10
OROGRANDE Cr abv FRENCH Cr	B	cutthroat	low fish	20
WASHINGTON Cr	B	cutthroat	high fish	10
LODGE Cr	B	cutthroat	moderate fish	10
TEEPEE Cr	B	cutthroat	moderate fish	10
TUMBLE Cr	B	cutthroat	moderate fish	10
ROCK Cr	B	cutthroat	high fish	10
LIGHTNING Cr	A	cutthroat	high fish	10
ROCK Cr abv MUSH PT	B	cutthroat	high fish	10

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
LARSON Cr	B	cutthroat	high fish	10
FLAT Cr	B	cutthroat	high fish	10
CAVE Cr	B	cutthroat	high fish	10
SPRAGUE Cr	A	cutthroat	high fish	10
JACKKNIFE Cr	B	cutthroat	high fish	10
SQUAW Cr	B	cutthroat	moderate fish	10
DEATH Cr	A	cutthroat	high fish	10
FISHER Cr	B	cutthroat	high fish	10
TRAIL Cr	B	cutthroat	high fish	10
DEADMULE Cr	A	cutthroat	high fish	10
DEADHORSE Cr	A	cutthroat	high fish	10
LITTLE WASHINGTON Cr	A	cutthroat	high fish	10
SWANSON Cr	A	cutthroat	high fish	10
EAGLE Cr	A	cutthroat	high fish	10
SNEAK Cr	A	cutthroat	high fish	10
SHEEP Cr	A	cutthroat	high fish	10
MORGANS Gul	A	cutthroat	high fish	10
SIWASH Cr	A	cutthroat	high fish	10
LOST PETE Cr	A	cutthroat	high fish	10
LOWER TWIN Cr	A	cutthroat	high fish	10
NF CLEARWATER R blw AQUARIUS	C	kokanee	no effect	0
ELK Cr blw DEER Cr	C	brook	minimum viable	20
LONG MEADOW Cr	C	brook	minimum viable	20
CLOVERLEAF Cr	C	brook	minimum viable	20
PARTRIDGE Cr	C	brook	minimum viable	20
ELK Cr nr Deer Cr (abv Sec. 14)	B	brook	high fish	10
JOHNSON Cr	B	brook	high fish	10
WF ELK Cr	B	brook	high fish	10
SHITE Cr	B	brook	high fish	10
ISABELLA Cr	B	cutthroat	high fish	10
ISABELLA Cr abv BLACK Cr	B	cutthroat	high fish	10
BLACK Cr	A	cutthroat	moderate fish	10
FERN Cr	A	cutthroat	high fish	10
DOG Cr	A	cutthroat	high fish	10
GOAT Cr	A	cutthroat	high fish	10
BEAVER Cr abv Forest boundary	C	cutthroat	moderate fish	10
SF BEAVER Cr	C	cutthroat	moderate fish	10
BINGO Cr	A	cutthroat	moderate fish	10
BERTHA Cr	B	cutthroat	moderate fish	10
SOURDOUGH Cr	B	cutthroat	moderate fish	10

(The BASIC water quality objective is assigned to all watershed systems. Key reach is near mouth, unless specified.)

WATERSHED (and critical reach)	Channel Type	Indicator Species	Water Quality Objective	Allowable yrs in 30 Exceeding Threshold
LITTLE NF CLEARWATER R at Forest boundary	B	cutthroat	no effect	0
MINNESAKA Cr	A	cutthroat	high fish	10
BEAR Cr	A	cutthroat	high fish	10
SALMON Cr	B	cutthroat	high fish	10
THRASHER Cr	B	cutthroat	moderate fish	10



Appendix L

Selway – Bitterroot Wilderness

APPENDIX L

SELWAY-BITTERROOT WILDERNESS

I. INTRODUCTION

The following management direction is applicable to the Clearwater National Forest portion of the Selway-Bitterroot Wilderness. This direction is taken from the Selway-Bitterroot Wilderness General Management Direction approved by the Regional Forester on June 25, 1982. It was prepared by the Nez Perce, Clearwater, Lolo, and Bitterroot National Forests. Some revisions were made here to reflect recent changes on the Clearwater Forest portion.

All future management direction will be prepared jointly by the above Forests and will be part of each Forest's Forest Plan.

A. VISITOR USE

Visitor use will be managed by application of the Limits of Acceptable Change process (LAC). The LAC process will be conducted by a Task Force comprised of representatives of each National Forest and users of the wilderness. This task force will: 1) define management areas, goals and objectives for the Selway-Bitterroot Wilderness; 2) select appropriate physical, biological and social indications with which to measure change in wilderness character; and 3) determine appropriate management action for protection of wilderness character. Such actions may include, but are not limited to:

1. Public information and education

2. Restoration, rehabilitation or alteration of wilderness resources

3. Restrict users, i.e., limit party size, length of stay, or equipment

4. Voluntary user registration

5. Site closures

6. Initiate a registration system. Post a destination signup sheet at portals to help managers and wilderness visitors learn where other visitors intend to camp. This method must be accompanied by public information efforts to work effectively.

7. Inform the public of site specific closures. Post notices on portals and at administrative sites, and sign sites as closed to all camping until further notice. This method also requires administrative followup.

8. Require visitors to register for a mandatory permit by checking in at an administrative site to obtain a camping permit. Administrative units need to coordinate and communicate numbers of persons permitted at specific problem sites. Administrative followup is required.

B. FIRE MANAGEMENT

1. Guide fire management in the Selway-Bitterroot Wilderness by individual annual forest fire management action programs.

2. Included below is a list of fire lookouts to be retained for fire planning or studied for historical significance.

To Be Retained for Fire Detection	To Be Studied for Historical Significance
Diablo Mountain	Graves Peak
Hidden Peak	McConnell Mountain
	Sponge Mountain

3. Limit fire prevention posters to portal areas.

4. Do not use tractors.

5. The following fire suppression activities will be adhered to as closely as possible:

   a. Use control measures which disturb the land as little as possible.

   b. Use motorized equipment where necessary to accomplish fire control. Helispots, generally, will be natural openings or existing cut-out helispots. Helispots will not be cut out of large timber stands unless there is a danger to human life, and no reasonable alternative exists. Forest Supervisor approval is required for all motorized activities for fire suppression and helispot construction. The use of tractors (dozers) must be approved by the Regional Forester.

   c. Cold trail the fire line whenever feasible instead of constructing fireline.

   d. Limb trees near the fire perimeter rather than cut down if necessary for effective control.

   e. Utilize helicopters to demobilize and rehabilitate a fire only when other methods would degrade the wilderness or if manpower is urgently needed elsewhere. Forest Supervisor approval is required for all activities which require landing.

   f. Use appropriate suppression response (confine, contain or control) which may sacrifice acres to reduce impacts of control lines.

   g. Follow specific Regional or Forest standards for wilderness fire suppression.

6. Continue to develop and expand wilderness fire management planning to include the entire Selway-Bitterroot Wilderness.

7. Clean up debris from all old fire camps.

C. INSECTS AND DISEASE

1. Allow insect or disease to play their natural role unless they are creating a serious threat to adjacent nonwilderness resources.

2. Permit vegetation within the area and the associated insects and diseases to provide a benchmark for scientific study and comparison.

3. Do not use motorized equipment, with the exception of overflights, in connection with insect and disease surveys.

D. WILDERNESS

Wilderness management will follow the legislative mandate of the Wilderness Act. The primary objective of wilderness managers will be to minimize restrictions necessary to preserve the resource of wilderness. Wilderness rangers will be used as needed to accomplish wilderness management objectives. Emphasis will be placed on educating the public about the concept of wilderness, proper camping techniques, primitive skills, and wilderness fire management. Use of the media, personal contacts, education programs, portal programs, and written articles and literature will be used to disseminate the information.

E. RECREATION

1. Dismantle and remove at the end of each period of use facilities such as toilets, corrals, caches, water systems, and fences. Exceptions must be approved, in writing, by the District Ranger.

2. See the section on Law Enforcement for restrictions on recreational use.

3. Close campsites and trails that show heavy overuse or that are poorly located depending on the situation. Restoration measures will be taken.

4. Do not permit air drops.

5. Make an effort to monitor winter recreation to forecast management problems and provide solutions.

F. VISITOR INFORMATION AND EDUCATION

1. Continue public education by Selway-Bitterroot Wilderness managers as the primary means of correcting visitor behavior and developing cooperative attitudes.

2. Promote a public education management goal of: A positive contact with every wilderness visitor either in person, by letter, brochure, news, media, or bulletin board.

3. Design education programs to teach methods and skills necessary for low impact use of wilderness including:

   a. Proper sanitation techniques

   b. Pack it in - Pack it out litter control

   c. Campsite selection, use and naturalization

   d. Low impact equipment (self contained stoves, light weight neutral colored packs and tents, lightweight foods and containers, etc.)

   e. Stock handling techniques (methods of containments, feeding and grazing, lightweight neutral colored equipment, safety first-aid, techniques and equipment, single file on trails, not cutting switch backs, protection of meadows and lake shores, etc.)

   f. Protection of natural features (bathing without polluting lakes and streams, wood gathering for campfires, tent poles, hitch rails and corrals, etc.)

   g. Safety (drinking water, safety equipment, first-aid equipment and techniques, hiking, fording streams, bear proofing camps, etc.)

   h. Role of fire and fire planning in wilderness management.

4. Expect Forest Service personnel to set the example of good wilderness ethics and low impact techniques in all aspects of work and administration.

5. Continue in-service education at all levels on the concepts of wilderness, proper camping techniques, primitive skills, and fire management.

G. VEGETATION

1. Require self-contained stoves (gasoline, propane, etc.) in areas where and when wood suitable for burning becomes scarce.

2. Prohibit hacking, girdling, and cutting green trees.

3. Encourage all wilderness campers to use manufactured tent poles.

4. Use salt in block form for stock. When used, it should be secured off the ground or placed on a large, rocky, non-erosive surface. All salt remaining at the end of the use period will be packed out.

5. Make any vegetation modification for wilderness purposes justified in an Environmental Assessment, and approved by the Regional Forester.

6. Permit outfitter use of green poles only if in accordance with an approved outfitter operating plan.

H. FORAGE

1. Do not permit any permanent fences. Forest Service fences used for control of administrative stock will be repaired as needed.

2. Use a guide for maximum forage of 25 percent utilization by weight of palatable vegetative species on key ranges. There can be a modification to this percentage for administrative pastures and outfitter permits that are under intensive management. On heavy use areas, condition and trend surveys will be installed and recorded.

3. Analyze administrative stock needs and make changes when warranted.

4. Give priority for utilization of forage to wildlife over recreational stock.

5. Limit vegetation improvement projects to those that qualify as site restoration with use of native and/or naturalized species.

6. Allow a weed to play its natural role unless it is creating a serious threat to adjacent nonwilderness resources. Before the decision is made to begin control efforts, an environmental assessment must be prepared, discussing the need for control and the method to be used.

I. WILDLIFE

1. Each Forest Service unit will actively work with the local Fish & Game Department officials on season, bag limits, and other regulations to coordinate hunting and fishing with the wilderness resource. The levels of both consumptive and nonconsumptive use of wildlife will be analyzed from the standpoint of preserving wildlife resources in as close to a natural state as possible. The levels of use should not significantly alter either natural population dynamics or behavior.

2. Give priority for wildlife research to species classified as endangered or threatened.

3. Discourage salting of wildlife.

4. Coordinate with respective State Fish and Game Departments to determine native species of wildlife which are suitable for re-establishment or reinforcement in the wilderness.

5. Permit reintroduction or supplemental transplant of terrestrial wildlife species, subject to the following criteria:

   a. The population of a threatened or endangered species would be enhanced; or

   b. The population of native species eliminated by the acts of man would be restored or enhanced; or

c. Wilderness values would not be impaired.

d. Guidelines:

(1) All introduction projects by a state agency shall have prior written approval by the Regional Forester.

(2) Transplants shall be made in a manner compatible with the wilderness character of the area.

(3) Motorized methods may be permitted if they are the minimum necessary to accomplish an approved transplant.

6. Control problem animals as necessary to reduce depredations on other wildlife and domestic livestock, to remove animals creating a public nuisance and to prevent transmission of diseases or parasites affecting other wildlife or humans outside the wilderness. Control of nonindigenous species may also be necessary to abate conflicts with native species, particularly if those native species are endangered or threatened. Control measures must be approved by the Regional Forester on a case-by-case basis.

J. FISHERIES

1. See item, "1" under Wildlife.

2. Allow fish planting or transplanting under the following criteria:

a. To re-establish or maintain an indigenous species, or

b. To restore an endangered or threatened species

c. Permit aerial planting where used prior to the passage of the Wilderness Act. A list of permissible aerial planting sites will be prepared jointly by the respective Fish and Game Departments and Forest Service units.

d. Coordinate timing of aerial plantings by the Fish and Game Departments with the Forest Service to reduce possible adverse impacts on wilderness visitors.

3. Permit clearing of debris, which impedes the migratory movements of fish on critical spawning streams, subject to Regional Forester approval.

4. Analyze the functional status of each hatching channel. Hatching channel sites not in use will be restored to approximate natural conditions.

K. WATER

1. Require an environmental statement on any weather modification projects affecting wilderness.

2. Prohibit the introduction of chemical agents, such as soaps, detergents, or bleaches into springs, lakes, or live streams. (36 CFR 261.11(c). Contamination of lakes and streams with fish entrails and other refuse is illegal under State law and will be discouraged through public education and law enforcement.

3. Take snow and water measurements in a manner consistent with the wilderness environment. Structures will not be permitted.

4. Protect administrative use springs from contamination by barricading with native materials.

5. As a guideline, stock should not be tied, corralled, or picketed within 300 feet of a lake, nor should they be tied, corralled or picketed overnight or for an extended period (over two hours) within 100 feet of a stream or spring.

L. SOILS

1. Permit natural erosion to occur unless extremely high downstream values warrant mitigation of catastrophic effects. Re-establishment of vegetation as a watershed restoration measure will be accomplished with native species.

2. Require approval by the Chief of the Forest Service for watershed restoration proposals.

3. Permit watershed restoration measures, utilizing native materials needed to correct conditions resulting from poor trail location.

M. MINERALS

1. Coordinate all mineral activities with the U.S. Geological Survey, Bureau of Mines, States of Idaho and Montana, and other related agencies, as needed.

N. LAND OCCUPANCY - NATIONAL FOREST LANDS

1. Each District will analyze new outfitter and guide applications or changes in existing operations in conjunction with neighboring Forest Service units, State Fish and Game Department officials, State Outfitter and Guide Associations, the Idaho Outfitters and Guides Board, and other interested groups. The analysis will consider at least the following topics:

a. Physical and social impacts the area can stand,

b. Trends in public use,

c. Big-game and fish populations,

d. Grazing availability,

e. The number and location of adequate campsites,

f. Key wildlife habitat (summer and winter),

g. The "solitude" factor,

h. Season of year, and

i. Demand from noncommercial sector.

2. The Forest Service and individual outfitter will jointly prepare an outfitter operating plan.

   The standards should in part, delineate acceptable developments and the extent of the development, including:

   a. Camp locations relative to trails, streams, lakes, and features,

   b. Authorized improvements including temporary facilities, and

   c. Camp layout.

3. The Outfitter Operating Plan will be the basis for determining conduct of outfitter and guide activities within the wilderness and should be updated annually.

O. TRANSPORTATION SYSTEM -- ROADS AND TRAILS

1. The Selway-Bitterroot Wilderness Forest Development trail system will be reviewed and updated prior to printing new wilderness maps.

2. Trail location or relocation objectives will:

   a. Protect wilderness character,

   b. Take advantage of vistas and scenic areas,

   c. Avoid campsites,

   d. Stay a minimum of 200 feet from lakes, and to avoid crossing meadows impassable due to terrain limitations,

   e. Avoid long straight alignments, both vertical and horizontal,

f. Leave some lakes and other attractions inaccessible by trail,

g. Design grade changes to provide natural drainage,

h. Take advantage of safe fords,

i. Consider the mode of travel expected to be used by most trail users,

j. Consider dispersion of visitors, and

k. Manage to minimize maintenance and erosion potential.

3. Construct no new trails within Pristine Areas. Existing trails within these areas will not be maintained.

4. Make the highest priority of work the prevention or correction of erosion problems on existing trails.

5. Construct or reconstruct bridges where there is not a safe ford and dispersal and safety of visitor traffic is important. Footlogs should be used as a substitute for a bridge when satisfactory.

6. Do not allow use of motorized equipment in trail maintenance, construction, or reconstruction unless approved on a case-by-case basis by the Regional Forester.

7. Designate as outfitter maintenance in special use permits tails that are used by an outfitter(s). The maintenance required shall be commensurate with use and in proportion to total use of the trail. When a trail is designated as outfitter maintenance, work specifications will be included in the Special Use Permit.

8. Construct new trails only after following NEPA procedures. Approval for construction by private parties, including outfitters, of non-system trails must be in writing by Forest Supervisors responsible after completion of NEPA procedures.

P. TRANSPORTATION SYSTEM - AIR TRAVEL

1. Do not expand public airfields. Maintenance will be limited to mowing, seeding bare spots, and smoothing ruts. Markers and windsocks may be maintained for safety purposes.

2. Limit aircraft use of airfields to periods when the surface is not sustaining damage due to excessive moisture.

3. Utilize air attack for fire control purposes. This includes initial helicopter usage to determine if a fire is to be controlled or monitored in accordance with an approved Fire Management Plan. Landings on other than approved airstrips require Forest Supervisor approval.

4. Do not maintain helispots.

5. Rehabilitate emergency helispots to a natural state as soon as possible. Native species will be used in such efforts.

6. Require aircraft owners to remove damaged aircraft.

7. Require use of airfields by organized groups to have a special use permit.

8. Continue working with the Air Force to limit as much as possible their overflights of the Selway-Bitterroot Wilderness.

Q. COMMUNICATION

1. Maintain the following inter-Forest radio system yearly:

   a. Clearwater Forest radio on Coolwater Lookout

   b. Nez Perce Forest radio on Diablo Peak Lookout or at Fish Lake.

2. Roll up and pack up abandoned phone line.

R. SIGNING

1. Provide direction and location signs as needed to permit visitors to locate themselves within the wilderness i.e. at trail junctions, major destinations, or major geographical features.

2. Use signs to post areas closed for site restoration.

3. Sign major portal areas in accordance with the portal area site plan.

4. Attach signs either to trees or native material sign posts.

5. Coordinate sign needs across unit boundaries with other units.

6. Wilderness trail signs shall be routed, unstained, unpainted oak or redwood in the modified rectangle shape specified in FSM 716, FSH 7109.11, 7109.11a and 7109.11b.

S. ADMINISTRATIVE ACTIVITIES & FACILITIES - INSIDE THE WILDERNESS

1. Clean-up and restore as nearly as possible to natural conditions sites where lookouts have already been removed, and where old dumps, cement footings, etc. still remain.

2. Special efforts must be taken by all wilderness managers to perpetuate the primitive work skills needed in wilderness management.

3. Continue efforts to reduce administrative flights as feasible through alternative means of transportation, consolidation of flights, unit organization, and work planning.

T. ADMINISTRATIVE ACTIVITIES & FACILITIES - ADJACENT TO THE WILDERNESS

1. Retain the Elk Summit Guard Station and the Lochsa Work Center facilities as "jump off" stations for wilderness management.

2. Review all existing wilderness portals and develop a schedule for completion of site plans for those portals needing such planning by each unit.

U. RESEARCH

1. Research is a valid use of the wilderness resource. Projects must be conducted to preserve the natural conditions of the wilderness with the imprint of man's work substantially unnoticed. All research projects must be approved by the Forest Supervisor.

2. Coordinate and prioritize research needs for the entire wilderness annually.

3. Involve all units with the various wilderness-oriented research groups. Following is a partial list of such groups located nearby:

   University of Idaho Wilderness Research Center
   Forest Sciences Lab, Missoula, Montana
   PNW Forest & Ranger Experiment Station
   University of Montana Wilderness Institute
   Northern Forest Fire Laboratory

V. OTHER GOVERNMENT AGENCY USE OF MOTORIZED EQUIPMENT

Require requests for use of motorized equipment by other government agencies in writing. Approval or denial will be based on criteria found under FSM 2326 and provided in writing by the Regional Forester.

W. LAW ENFORCEMENT

1. Initiate an active program to inform the public of the following wilderness regulations with an emphasis on correcting visitor violations through developing a cooperative attitude.

   a. There will be a maximum of 20-head of pack and saddle stock per party. (36 CFR 261.58f)

   b. The maximum number of persons permitted in any hiking, riding, or flying group will be 20. District Ranger(s) may increase this limit for specific cases where the areas to be used can support the increased use. (36 CFR 261.58f)

c. No group or individual will be permitted to occupy a campsite for more than 14 days within any 45-day period without written approval. (36 CFR 261.58a)

d. All unburnable debris will be packed out of the Selway-Bitterroot Wilderness. Visitors will either burn or pack out combustible waste. (36 CFR 261.57g)

e. Hacking, girdling, or cutting green trees is prohibited. Cutting green trees for tent poles may be permitted for wilderness purposes. (36 CFR 261.6a)

f. Salt for pack stock will be used in block form. When used it should be secured off the ground or placed on a large rocky, nonerosive surface. All salt remaining at the end of the use period will be packed out. (36 CFR 261.57b)

g. Chemical agents, biodegradeable or not, such as soaps, detergents, or bleaches will not be allowed to enter any springs, lakes, or live streams. Contamination of lakes and streams with fish entrails and other refuse is illegal under State law. (36 CFR 261.11c)

h. Possessing or using a saddle, pack, or draft animal on any trail is prohibited (36 CFR 261.55c)

i. Shortcutting a switchback on any trail is prohibited (36 CFR 261.55d)

j. Storing equipment, personal property or supplies for more than 14 consecutive days within any 45-day period. (36 CFR 261.57f)

2. Train wilderness rangers to Level II law enforcement standards.

3. Continue to work with court systems to keep them informed of problems associated with wilderness.

X. CULTURAL AND HISTORIC

1. Inventory and research old cabins. Consult with the State Historic Preservation Officer to determine if any structures meet criteria for nomination to the National Register of historic places. Structures not qualifying will be allowed to deteriorate naturally or removed and the site rehabilitated to a natural condition. Structures nominated to the National Register will be managed in accordance with applicable laws, regulations, and policies.

2. Inventory existing historical grave sites. Headmarkers may be restored and perpetuated.

3. Inventory and document Forest Service administrative buildings to evaluate for nomination to the National Register of Historic Place.s

4. Leave signs relating to the early history of the area, such as Selway National Forest signs, in place to deteriorate naturally.

Y. PRISTINE AREAS

1. The management objective for these areas will be to retain their pristine character.

2. Allow no trail maintenance, construction, or reconstruction in these areas.

3. Allow no signs to be placed in these areas; remove existing signs.

4. Allow no campsite developments.

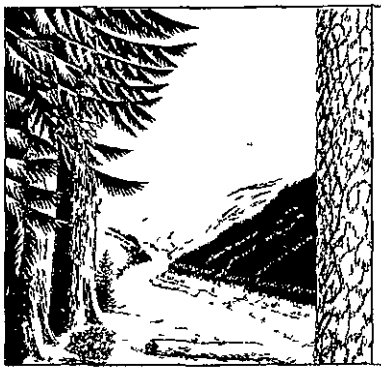
Z. AIRFIELD PORTALS - FISH LAKE

The management direction, in general, will be to limit air traffic within the wilderness to insure safety of the aircraft user and solitude of the wilderness user.

AA. AIR QUALITY

1. Maintain or improve the present quality of visibility within the area on a best-day basis (the day of least natural impairment) so that: man-made air pollution from one or a combination of major stationary sources will not reduce a normal person's ability (with correctible 20/20 eyesight) to clearly distinguish form, line, color, and texture of the landscape at a distance of 5 miles from any point within the area. ALso form and line can be distinguished at a distance of 50 miles looking out of the area.

2. Continue to monitor and document air quality.



Appendix M

Potential Wild and Scenic Rivers

APPENDIX M

POTENTIAL WILD AND SCENIC RIVERS

This Appendix lists Forest rivers/streams which are eligible for Wild and River Scenic River Study. Table M-1 lists each river/stream, its location, and its highest potential classification. Maps are then included of each potential river/stream location.

See Chapter II of the Forest Plan, page 36, for management direction which applies to these rivers/streams.

Table M-1. Wild and Scenic Rivers Highest Potential Classification, by Segment for the Clearwater National Forest

River/Stream	Segment/Location	Potential Classification
Kelly Creek	1. Mouth to FR #581 bridge	Recreation
	2. FR #581 bridge to source	Wild
Cayuse Creek	1. Mouth to Silver Creek Jct.	Scenic
North Fork of the Clearwater	1. Dworshak high pool to FR #255 bridge	Recreation

POTENTIAL WILD & SCENIC RIVER SYSTEM

U S DEPARTMENT OF AGRICULTURE
FOREST SERVICE

CLEARWATER NATIONAL FOREST
IDAHO
1985

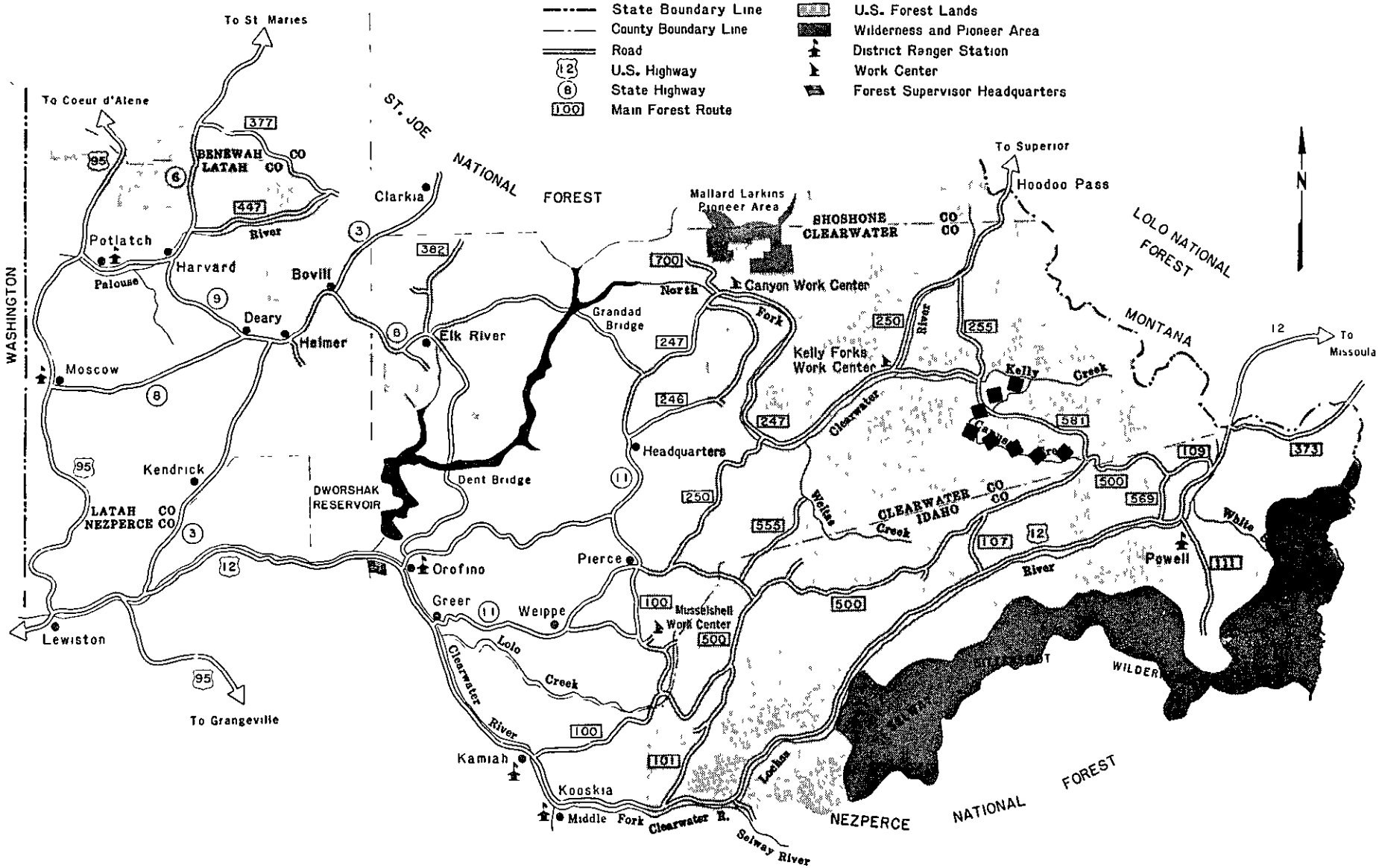
SCALE
0 5 10 Miles

CAYUSE CREEK

Scenic

LEGEND

- State Boundary Line
- County Boundary Line
- Road
- U.S. Highway
- State Highway
- Main Forest Route
- U.S. Forest Lands
- Wilderness and Pioneer Area
- District Ranger Station
- Work Center
- Forest Supervisor Headquarters



POTENTIAL WILD & SCENIC RIVER SYSTEM

U S DEPARTMENT OF AGRICULTURE
FOREST SERVICE

CLEARWATER NATIONAL FOREST
IDAHO
1985

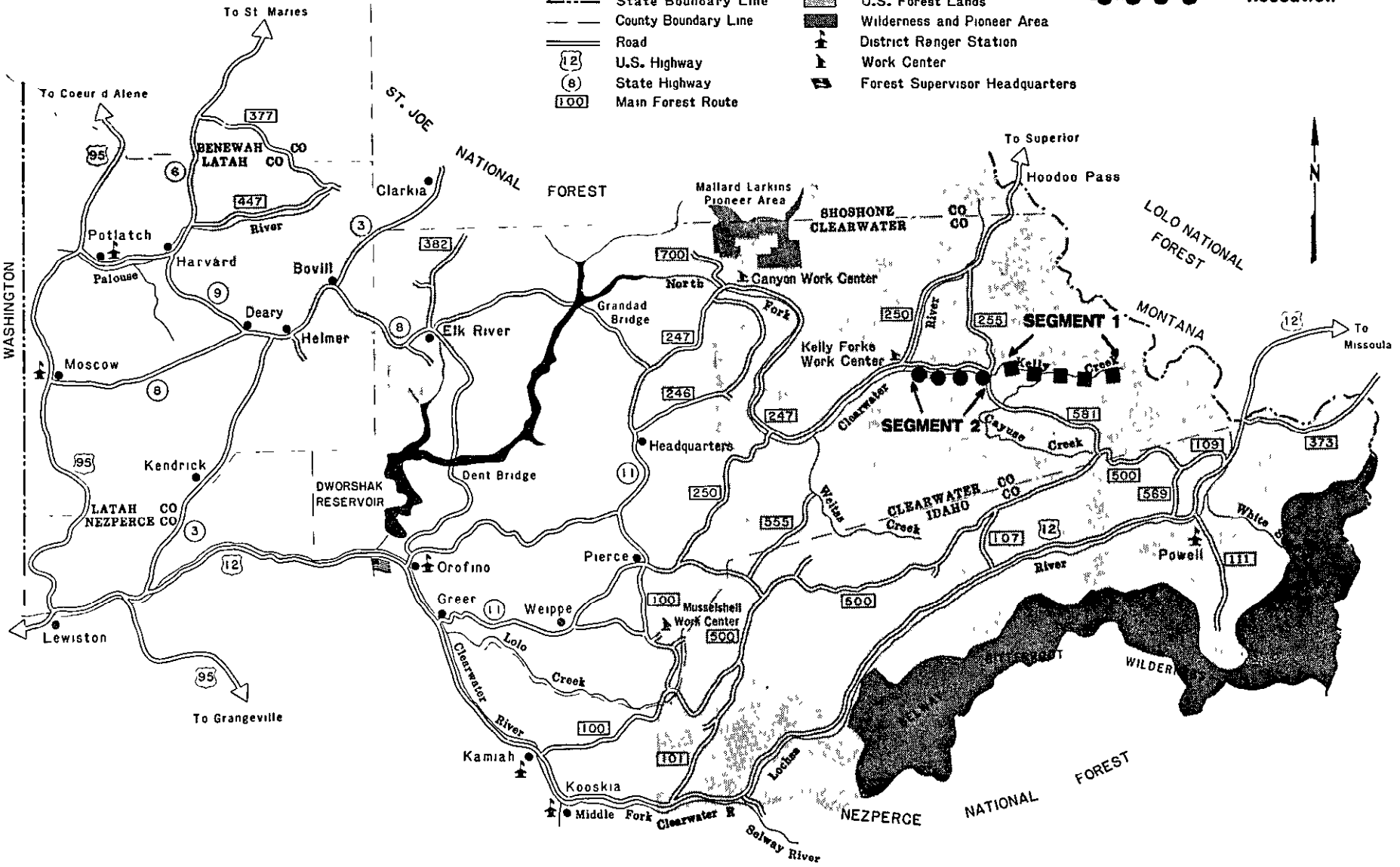
SCALE
0 1 5 10 Miles

LEGEND

- State Boundary Line
- County Boundary Line
- Road
- U.S. Highway
- State Highway
- Main Forest Route
- U.S. Forest Lands
- Wilderness and Pioneer Area
- District Ranger Station
- Work Center
- Forest Supervisor Headquarters

KELLY CREEK

- Wild
- Recreation



POTENTIAL WILD & SCENIC RIVER SYSTEM

NORTH FORK OF THE CLEARWATER

Recreation

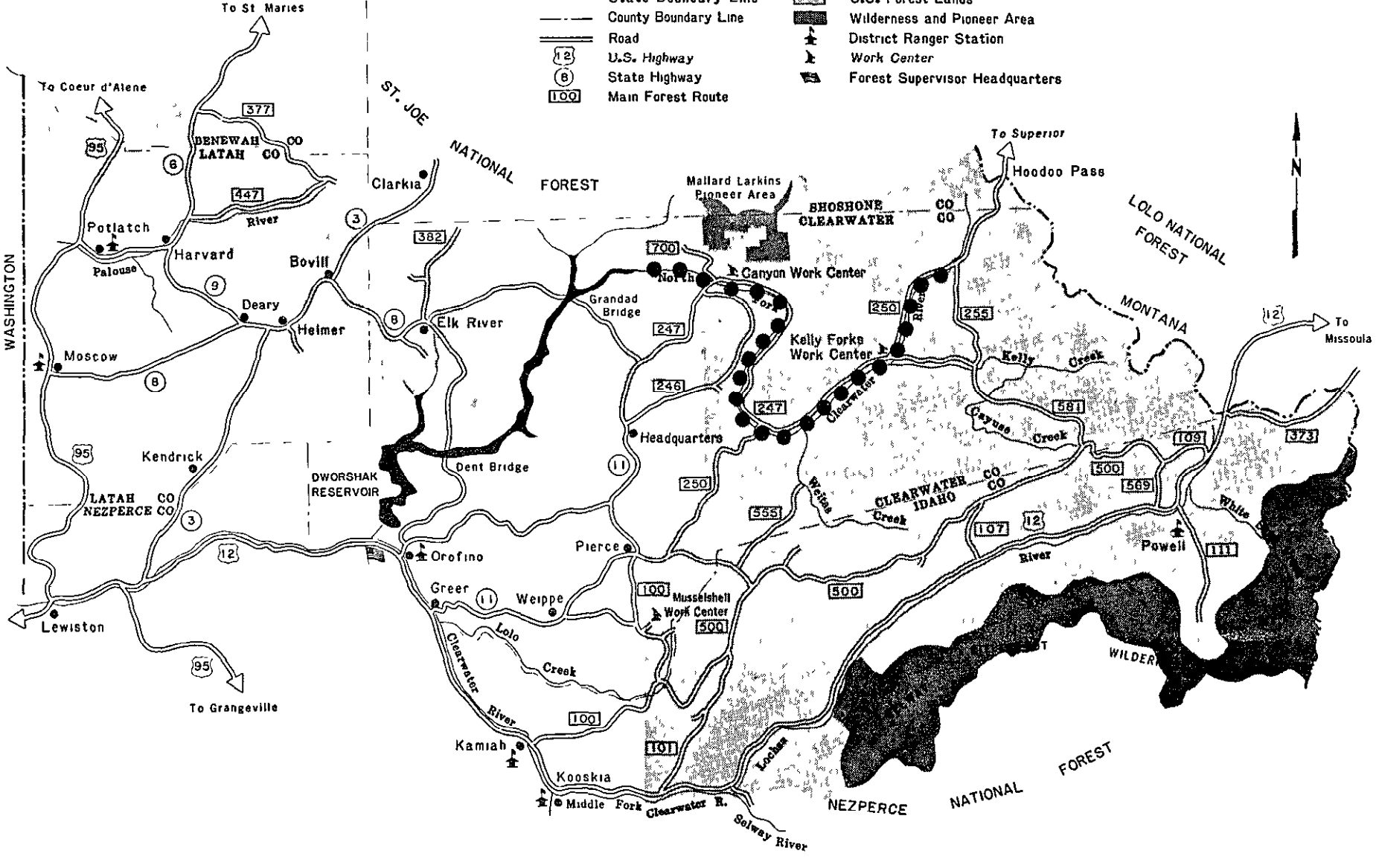
U S DEPARTMENT OF AGRICULTURE
FOREST SERVICE

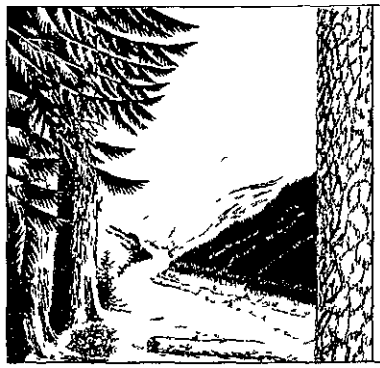
CLEARWATER NATIONAL FOREST
IDAHO
1985

SCALE
0 1 5 10 Miles

LEGEND

- State Boundary Line
- County Boundary Line
- Road
- (12) U.S. Highway
- (8) State Highway
- 100 Main Forest Route
- U.S. Forest Lands
- Wilderness and Pioneer Area
- District Ranger Station
- Work Center
- Forest Supervisor Headquarters





Appendix N

Noxious Weeds

APPENDIX N

NOXIOUS WEEDS ON THE CLEARWATER NATIONAL FOREST

A Situation Report

August 1985

Prepared By: Henry E. Johnson, Forestry Technician
Palouse Ranger District, Clearwater National Forest

TABLE OF CONTENTS

I. INTRODUCTION

The purpose of this report is to:

1. Assess the present magnitude of the noxious weed problem on the Clearwater National Forest;

2. Suggest a possible course of action.

The objective is to make Forest Service managers, administrators, cooperators, and permittees aware of noxious weed problems and opportunities to deal with them, as well as the consequences if little or no action is taken.

A. NOXIOUS WEED DESIGNATION

The term "noxious weed" is a legal designation and not a biological term. County and State laws designate certain plant species as "noxious" and require landowners to control them. A "weed" is no more than a plant outside its desired location or a certain plant where it is not wanted. All species considered noxious on the Clearwater National Forest are native to another location. Most of our noxious species came from Europe and Asia in the early part of this century, mixed with impure seed, hay, or domestic livestock. Removed from their natural ecosystems, predators and competitors, these species rapidly spread in their new environment. The decrease of desirable native/domestic species and the increase in these undesirable/unpalatable (and sometimes poisonous) species is the essence of what is referred to as the noxious weed problem.

B. SPECIES

Each of the five counties on the Clearwater National Forest designates species considered noxious within their area, as does the State of Idaho. These species lists do not necessarily correspond with species considered noxious on the Clearwater National Forest. Exposure, elevations, soils, and weather limit the establishment of several of these species. The county lists frequently include species whose occurrence is limited primarily to cropland situations. The primary species considered problem noxious weeds on the Clearwater National Forest are:

Spotted Knapweed (Centaurea maculosa)
Diffuse Knapweed (Centaurea diffusa)
Canada Thistle (Cirsium arvense)
Dalmation Toadflax (Linaria dalmatica)
Common Crupina (Crupina vulgaris Cass.)
Yellow Starthistle (Centaurea solstitialis)
Creeping Matgrass (Nardus stricta)

Other species, which are present in ever increasing amounts and not on the State noxious weed list could increase invasion at any time and incur a considerable loss in productivity, visual quality, and a health risk and nuisance to the recreating public:

Scotch Broom (Cytisus scoparius)
Hawk Weeds (Hieracium sp.)
Oxeye Daisy (Chrysanthemum levcanthemum)
Poison Ivy (Rhus radicans)

The Palouse District being located adjacent to agricultural cropland is exposed to larger variety of invader species than the remainder of the Clearwater National Forest.

The corridor along Highway 12 is exposed to greater number of exotic species transported by tourists and grain trucks from the east side of the divide.

C. SITUATION

These noxious species constitute a considerable threat to portions of the Clearwater National Forest for several reasons. The primary ecological threat is that these species are aggressively superior competitors. They have been introduced into plant communities which have had a relatively short history of intense grazing pressure or land management activities creating vegetation disturbances (150 years) from plant communities in Eurasia in which they evolved subject to long, intensive grazing pressure (200 years plus). The result is that they are much better adapted for competition and rapid establishment than the species which naturally occur on the Clearwater National Forest. This is compounded because many of these species primary successional niche is that of a "pioneer". Management activities involving ground or vegetation disturbance create a situation ideal for invasion of noxious species.

Improvement of in-Service awareness and comprehension of the magnitude of the problem is necessary. Relatively frequent changing of managers and low funding levels compound the problem. It is common for both in-Service personnel and the public to perceive that the problem is so widespread that it is beyond the reach of any practical control effort. Preferability of "quick fix" solutions make it difficult to grasp a long time developing problem whose solution requires relatively subtle long-term changes in vegetation composition and density.

This situation is further reinforced by the fact that the casual agents which spread noxious weeds are not immediately affected. For example, soil/vegetation disturbance from timber harvest or road building activities, which result in creating conditions favorable for the establishment of undesirable invaders are not directly affected when these species invade. The negative impacts are translated to subtle changes in vegetation composition. In another example, decreased forage availability on livestock ranges may result from seed imported by recreational vehicles. This may force stock into riparian areas which may be too wet to sustain the weed. This extra pressure in riparian areas can:

1. decrease available livestock forage;

2. decrease the quality of riparian habitat;

3. modify the natural ecosystems;

4. degrade the available recreation experience;

5. degrade fisheries habitat; and

6. reduce big game forage.

Even if livestock are removed to provide more forage for big game, the forage available for big game continues to decrease as the noxious weed invasion continues and outcompetes desirable vegetation. In this example, noxious species introduction from recreational activity is translated into negative impacts to range, riparian values, fisheries, and wildlife. In another example, a newly constructed road allows introduction of noxious species into a clearcut unit. Once established in the clearcut, the weed may deposit alopathic substances into the soil which impacts seedling establishment and hinders browse production. (Cranston, R., "Knapweed, Its Cause and Effect in British Columbia" and French, Roxa, "Spotted Knapweed, Its Cause and Effect on Montana Rangeland.") In this case, the road building impacted timber management and wildlife. Any soil or vegetation disturbance creates a situation suitable for the spread of noxious weeds. Methods of spread will be further addressed in this text.

II. MAGNITUDE AND CONSEQUENCES OF THE PROBLEM

It is important for land managers to have a good understanding of the magnitude and consequences of the noxious weed problem in the local area, when setting priorities for the allocation of funds and human resources to manage it. This is difficult because inadequate information is available on the current location of infestations, methods and rates of spread, and biological and economic consequences of the species involved.

Managers on the Clearwater National Forest indicate that there are nine species of noxious weeds currently on the Forest on an undetermined amount of infested acreage within the Forest boundaries. Only limited information is available on the density of infestation by area. In some cases, more than one species occurs on a site, so acreage estimates are often duplicated. The intermingled nature of land ownership, terrain, and dense vegetation makes it very difficult and expensive to accurately calculate locations and area of infestations.

In recent years, several excellent professional papers and technical bulletins have been published concerning noxious weeds. Available information includes species history, life cycle, taxonomy, and adverse as well as beneficial characteristics. Current information is more available for certain species than for others. Adverse impacts are obvious in some cases, while others may be subtle or not become apparent for several years.

The following section provides a summary of important characteristics of the noxious weeds which exist on the Clearwater National Forest.

A. CHARACTER BY SPECIES

1. Knapweeds

a. Spotted Knapweed is by far the most rapidly spreading noxious

species on the Clearwater National Forest and yet it is relatively a newcomer. This aggressive plant functions primarily as a pioneer species on disturbed sites although it has also evolved the capability to invade already occupied sites. The rate of invasion of occupied sites depends upon condition of present species, soils, and degree of disturbance. It is generally an intolerant species which spreads best in well-drained, gravelly soils. It seldom occurs in wet riparian areas and similar subirrigated sites. It is classified as a "long lived biennial," a somewhat redundant term used to describe a two-year cycle and a generally three to seven-year life span, depending on the site. Its extremely aggressive character is compounded by its long-lived seed. An individual plant in western Montana can produce an average of 1,000 seeds per plant (French, Roxa, "Spotted Knapweed, Its Cause and Effect on Montana Rangeland") which can remain viable in the soil for six to eight plus years. This remarkable survival strategy is compounded by the plant's ability to exert an inhibitory effect on the soil. This allopathic character is presumably expressed as the deciduous leaves decompose in the soil. (French, Roxa, "Spotted Knapweed, Its Cause and Effect on Montana Rangeland"). As the leaves decompose in the soil, they deposit a substance which significantly hinders growth or germination of other plant species. This character explains the common occurrence of nearly pure "saturated" knapweed stands.

Knapweed has no forage value for livestock or big game. In fact, high levels of consumption of either species can cause toxicity symptoms, especially in horses. (Higgins, Schirman, Know and Control Spotted, and Diffuse Knapweed)

b. Diffuse Knapweed is similar in character to Spotted Knapweed except that it tends to prefer ever drier and harsher sites. It is even less palatable. The decreased palatability is mostly a physical characteristic in that the flower bracts are spiny. Diffuse knapweed flowers are usually white, while Spotted Knapweed flowers are only occasionally white and usually are purplish.

c. Russian Knapweed is seldom found on the Clearwater National Forest. It differs from other knapweed in that it is rhizominous and is more toxic to horses.

The beneficial characteristic of knapweeds are as follows:

(1) It is favored by beekeepers for the quality honey produced from its flowers. (It is unlikely, however, that any control program could ever be thorough enough to seriously impact this use.)

(2) Its aggressive establishment and pioneer nature make it useful for stabilizing recently disturbed soil.

(3) It provides adequate cover and habitat for some birds.

(4) Some rodents and birds will eat the seeds (this practice helps plants spread to new areas).

(5) It has some usefulness in dried flower arrangements.

2. Dalmation Toadflax is a short-lived perennial plant that spreads by seed and heavy lateral roots. It has bright yellow flowers tinged with orange. Flowers are one to one and one-half inches long. Seed pods, flowers, and flower buds are often present at the same time on the long flowering stalk. At present, it is found principally in drier areas, usually in rangeland, vacant disturbed areas, waste areas, right-of-ways, and similar locations. Dalmation toadflax has no value as a forage plant. (PNW Agriculture Extension Service Bulletin #135). Its danger lies in its ability to crowd out valuable forage species.

3. Canada Thistle is a deep-rooted perennial which spreads by seeds, roots, and rhizomes. Seeds develop early and are ready to germinate eight to 10 days after the flowers have opened. Each seed is attached to a tiny "parachute" that can be carried long distances by air currents. Wind spreads Canada thistle seed throughout the countryside.

4. Common Crupina also known as bearded creeper, is a winter annual species that reproduces by seed. A member of the Compositae family, the weed is a close relative of the knapweed species, all members of the Centaurea tribe. Common crupina seeds germinate in the fall when soil moisture is adequate. Large, succulent cotyledonary leaves emerge first and then a basal rosette forms. A dense fibrous root system develops quickly after the seedlings are established (Lee G. A., D. W. Wattenbarger, T. L. Miller, W. J. Schumacher, U of I Cooperative Extension Service, Information Series No. 542). Common crupina is relatively unpalatable, so wildlife and livestock do not normally feed on the plants. The species is competitive and forms solid stands reducing forage production and range carrying capacity.

5. Yellow Starthistle is normally a winter annual which begins growth in the fall with the emergence of oblong, tongue-shaped cotyledons. In early spring, seven or eight lobed, basal leaves emerge to form a rosette as the plant continues to increase in growth. In mid-July and early August, the flowering stage can be recognized by the appearance of bright dandelion yellow flowers. Yellow starthistle, like many destructive weeds, can produce several thousand seeds per plant, many of which may remain alive and dormant in the soil for several years. In early spring, cattle will graze on yellow starthistle where solid stands occur. The plant can be toxic to horses and several incidences have been documented. As yellow starthistle plants mature, they become unpalatable, and livestock avoid the sharp, spiny plants. (Callahan R. H., R. L. Sheley, C. C. Thill, U of I Agriculture Extension Service, Information Series No. 634)

6. Hawkweeds

a. **Meadow hawkweed**, Hieracium pratense Tausch., the yellow flowered plant has bristly-haired, narrow, elongated leaves four to six inches long, attached near ground level, and a leafless flowering stalk arising from the center of the leaf cluster to a height of six to 36 inches. Plants of both hawkweed species persist and regrow each year from short, below ground rhizomes and often spread by above ground stolens that resemble strawberry runners. The flower head matures in late June and July and contains 12 to 50 tiny, black, elongated seeds that have a white papus or beardlike tuft of hairs. These hairs enable the seed to be easily windborne. These hawkweeds multiply

profusely, spread swiftly by seed and compete fiercely with pasture and range plants species.

b. Orange hawkweed, Hieracium aurantiacum L., has a bright orange flower that is showy. Other than the flower color this species appears to be identical to the Meadow Hawkweed. (Callihan R. H., D. C. Thill, D. W. Wattenbarger, U of I Agriculture Extension Service, Information Series No. 633)

7. Creeping Matgrass is a wiry tufted perennial grass that spreads by seed. Individual plants grow into a dense circular mat that eliminates vegetative competition. Livestock and wildlife avoid matgrass because of its stiff, sharp leaves and this provides a competitive advantage to this species where grazing is practiced. Because of the species low palatability, an apparent broad habitat suitability, and the limited availability of techniques for selectively controlling a single species of grass from pastures and range, matgrass has the potential of becoming an important pest. Matgrass infestation has been reported at only one site in Idaho to date and this is on the Palouse Ranger District.

8. Oxeye Daisy is a perennial plant that spreads by seed and branching from a heavy rootstock. Plants are one to three feet tall often in patches or clumps. Oxeye daisy is a native of Europe, probably brought to the United States in commercial seed. It sometimes appears in gardens under the name marguerite. It is becoming a common weed of roadsides, fields and meadows, even though it is relatively new in this area. Livestock and wildlife tend to avoid the plant as they graze.

9. Scotch Broom is a deciduous shrub that is commonly grown as an ornamental that has escaped. The shrub spreads by seed and can form dense brushy stands that are practically impenetrable. The shrub is very commonly established west of the Cascades and is spreading rapidly. There are two reported isolated populations of Scotch Broom on the Clearwater Forest. An estimated two to three acre site at the mouth of Canyon Creek on Lochsa Ranger District and a one-quarter acre site on the Palouse Ranger District.

10. Poison Ivy is a slender shrub of which many persons are allergic and break out in a burning or itching rash if they have contacted it in any way. This plant becomes undesirable when it inhabits heavily used recreation sites such as the campgrounds along U.S. Highway 12.

B. ACREAGE INFESTED AND ANTICIPATED SPREAD

1. Methods of Spread

a. Travelways - Construction, reconstruction, and maintenance of Forest roads easily facilitates the introduction, spread, and establishment of noxious weed species. New construction of roadways into previously undisturbed plant communities not only creates a suitable seedbed, but in itself acts as an entry point for the seed source. Vehicles used by Forest Service personnel, road contractors, loggers, and the general public, carry in seed on the vehicle undercarriage, nooks, and crevices. The construction/logging activity itself prepares the seedbed and even a few seeds of these aggressive and quickly establishing species can quickly occupy the site. This spread is not linear

but exponential, causing the problem to increase rapidly. Noxious species then extend their competitive advantage over nature or introduced desirable species.

Even when sites are seeded to desirable species, after construction or harvest, this seeding is not thorough enough to totally occupy the site. Subsequent maintenance activities, such as road grading or site preparation, compound the problem by stressing or eliminating any already established desirable species and again create an optimum seedbed for more noxious species to invade. One sprig of knapweed (containing hundreds of seeds) dragged or carried under a vehicle along a forest road can effectively seed a "transect" several miles long along a travelway. This pattern of spread is clearly demonstrated on the Forest noxious weed map. Travelways are first infested and from there the problem spreads outward. Once a travelway is infested, subsequent vehicle travel picks up more seed from the middle and shoulders of the road and carries seed further along the road.

Off-road vehicle use helps spread seed further away from the primary travelway.

b. Waterways - Primary rivers and streams provide another significant entry point for noxious weeds. As a waterway meanders through public and private lands, seed is carried downstream, particularly from agricultural lands and roads along waterways. This seed is transplanted downstream to uninfested sites.

c. Domestic Livestock - Horses and cattle transport considerable amounts of weed seed onto the Clearwater National Forest via their digestive tracts. As the weed establishes on the range, they aid in its transport by picking up seed again in their hair and/or passing seed again through their digestive tracts. In areas popular with horseback riders, seed is brought onto the Clearwater National Forest in impure hay and unclean feed, in addition to that carried in horses' tails, manes, hair, and digestive tracts.

The problem is further compounded once the weed species establishes. Livestock will then selectively graze desirable vegetation, but not less palatable weed species. This practice actually benefits the weed and decreases competition with desirable vegetation. The noxious species is then encouraged to develop a healthy seed crop to further reinvade that and adjacent sites.

d. Right-of-Way Development/Abandonment - Development (such as the BPA Right-of-Way) and abandonment (such as the Milwaukee Road) of right-of-ways contributes to the spread of noxious weeds in much the same way as does road construction and timber harvest. Very large projects, such as the BPA powerline, create particular hazards in that the construction contracts are frequently awarded to large out-of-state contractors. When these contractors enter the area, they bring in equipment and other seed transporting items which increase the likelihood of introducing weed seed of species not already identified on the Clearwater National Forest in addition to wider infestations of already present species.

e. Wildfire - Wildfires contribute to noxious weed spread by removing native vegetation and preparing a suitable seedbed for seedling establishment. In addition, large influxes of men and equipment from out of the immediate area can transport undesirable seed.

f. **Wildlife** - This method of seed spread is limited primarily to some birds and other nongame species which may feed on weed seed, transport it, and pass it through their digestive tracts. In some areas, big game trails and hoof impressions provide sufficient soil disturbance for weed establishment. This is especially effective in spreading weeds on winter range areas.

g. **Wind** - Wind is thought to play a limited role in weed seed dispersal on all but the western portions of the Clearwater National Forest. The extremely rugged and mountainous character of most of the Forest, combined with the design of the seed of noxious weeds, do not facilitate considerable dispersal by wind, with the exception of Canada thistle. This method is primarily limited to flatter ground adjacent to agricultural lands and disturbed sites.

2. Rate of Spread

Future projection of population increase is difficult to accurately determine, due to innumerable variables in management activity, use patterns, control efforts, economy, etc.

An assumption of these spread rates is that spread is not a linear expansion, but rather exponential. The longer the plants are allowed to spread, the more difficult and expensive the solution becomes.

Although information is lacking on rates of spread for several species, patterns of distribution found on the Lolo National Forest in Montana give us some clues about what might happen in the future. For example, Spotted Knapweed tends to be intolerant to shade, avoids moist sites, and does not spread well at higher elevations (above 6,000 feet). This species tends to form dense stands only on the more open, well-drained sites at lower elevations.

Land areas, potentially capable of producing similar plant communities at climax, have been aggregated into habitat types. The moister habitat types produce tree and shrub cover which are not as likely to support Spotted Knapweed because of the effects of shading and moist soils. However, these same habitats may support Spotted Knapweed on those sites disturbed by activities such as road or skid trail construction.

3. Consequences of Problem

The relatively subtle and sometimes gradual invasion of a noxious weed species onto a site causes significant on-site and off-site damage. Most resources experience direct or indirect impacts. Invasion of these species into an area warrants considerable concern and should necessitate immediate action. Some of these impacts are as follows:

a. Loss of forage production/habitat. As noxious species invade and replace desirable vegetation, the forage production is decreased. Studies indicate losses in forage productivity are frequently 75-90 percent, in stands saturated with noxious weeds. (Cranston, R., "Knapweed, Its Cause and Effect in British Columbia"; French, Roxa, "Spotted Knapweed, Its Cause and Effect on Montana Rangeland"; Hann, W., "A Taxonomy for Classification of Seral

Vegetation of Selected Habitat Types in Western Montana" and Leininger, W. C., J. E. Taylor, and C. L. Wambolt, Poisonous Range Plants in Montana). This drastically decreased production reduces carrying capacities for wildlife (both game and nongame) and domestic livestock. Shrubs, grass, and tree growth can be reduced through direct competition for moisture, nutrients, and in response to allelopathic substances in the soil. Reproduction of new seedlings is likewise impacted. These impacts are difficult to specifically quantify and further research/study is needed. The complexities of quantification is one of the difficulties in fully grasping the severity of the situation.

The decrease in production, in turn, degrades habitat, particularly for game species, and may further pressure big game into private, cultivated winter rangers, causing additional conflict and management difficulties. Loss of critical winter range further contributes to decreased populations and the many impacts associated with the situation.

Both wildlife species and domestic livestock are subject to injury and mortality from poisoning. Although noxious species are generally unpalatable and not preferred, a stressed animal suffering from starvation or subjected to a decrease in palatable species or habitat, can inadvertently be forced to change grazing patterns and species selectivity. (Willie Huot, Mineral County Extension Agent, and Monfore, John D., "Livestock - A Useful Tool for Vegetation Control in Ponderosa Pine and Lodgepole Pine Plantations".)

Secondary impacts from decreased forage production involve hunting, viewing big game, and local livestock operations.

Fisheries and stream channels suffer as noxious species compete with and slow development of shrub species necessary for riparian habitat, shading, and bank stabilization. Decreased production on adjacent ranges force stock onto highly productive riparian range. Such disproportionate pressure on riparian areas accelerate bank sloughing and can force stock to turn to shrub species.

Fuels and fire hazard are increased when unpalatable noxious species invade desirable and palatable plant communities. Livestock and big game will not remove this unpalatable fuel and this results in additional fuel buildup.

Wilderness and roadless area management calls for maintenance of naturally appearing ecosystems. Noxious weed species are introduced through stock use and travel by Forest visitors. Introduction and spread of noxious weed species significantly degrades visual quality as well as changes the composition of the plant community. These factors artificially modify the wilderness ecosystem and degrade the naturalness of the area. Recreational values are compromised when once open meadows and grassy areas transform into coarse and rank smelling weed communities.

Private landowners adjacent to the Clearwater National Forest complain that their weed control programs are nullified when noxious species are allowed to go to seed, year to year, on their neighbor's lands. Although many of these species originated on private agricultural land, their total spread has created a constant situation in which infestation and re-infestation presently occurs back and forth, private to public land and vice versa. The Clearwater National Forest is, in many cases, that neighbor. The availability of weed seed makes

weed control a yearly task with little chance of making any long-term permanent progress. Off-site production of weed seed on the Clearwater National Forest decreases production on adjacent private agriculture lands.

Failure to control noxious weeds is also a violation of State law. Idaho Noxious Weed Law Section 22-2444, Idaho Code, states that landowners with land that have noxious weeds standing, being, or growing on such land shall be destroyed or eradicated by effective cutting, tillage, cropping, pasturing, or treating with chemicals or other effective methods, as often as may be required to prevent the weed from blooming and maturing seed, or spreading by root, root stalks or other means. One of the purposes of the law is to encourage all landowners in an area to treat infestations on a cooperative basis. The efforts of a few are lost when a seed source continues to exist and reinfest areas which have been treated.

The above discussion of impacts of noxious weeds on the Clearwater National Forest, addresses only some of the primary impacts. Secondary impacts are numerous and compound the problems as they move through the primary food chains which form an integral component of natural/managed ecosystems.

4. Cost of Loss - Specific quantification of the cost of the loss incurred is very difficult for two reasons: (1) there is a deficiency in available data for quantifying the impact of weed invasion and competition outside of cultivated agricultural crops; and (2) much loss is incurred to intangible type items (i.e., aesthetic degradation, habitat loss, or lower quality hunting).

III. NOXIOUS WEED CONTROL

Certain species of noxious weeds have been effectively controlled in localized areas, but spread unchecked elsewhere. Control methods which are effective in one situation, may not work in another. The land manager must have good knowledge of the barriers to noxious weed control, alternative methods available for control, and the approximate costs involved. Following is some background information concerning the situation on the Clearwater National Forest and suggestions on alternatives for a control action plan.

A. BARRIERS TO WEED CONTROL

Control of noxious weeds on the Clearwater National Forest is generally a more difficult task than control of like species on agricultural land. Barriers to control on Forest ground include the following considerations:

1. Lack of Natural Enemies - Since most of these species came from Europe and Asia, they established on the Clearwater National Forest in the absence of the natural enemies (both biotic and abiotic) which kept populations in check in their native ecosystems. Research is presently continuing on biological control, aimed at selectively introducing some of their old enemies into their new environment.

2. Mixed Land Ownership - A successful weed control program must have the commitment and participation of all landowners. The mixed ownership patterns are most prevalent, and are also the highest areas of risk because of

proximity to agricultural (soil disturbing) activity. An uncoordinated control effect is very similar to no control.

3. Steep Terrain - makes it physically difficult to treat areas and raises unit costs considerably.

4. Continual Seed Introduction - Since much of the Forest is open to the driving, walking, or riding public, control is a maintenance job that can never be completed. Visitors carry seed on vehicles, on their clothing, and on or in their pack and saddle stock.

5. Continual Soil Disturbance - creates a seedbed for weed establishment. Everyday practices, such as logging, road building, road maintenance, and off-road vehicles are continually disturbing portions of the existing vegetation and soil, and creating conditions favorable for weeds.

6. Funding - Allocation of funding seldom demonstrates a realistic awareness of the magnitude and importance of noxious weeds on the Clearwater National Forest. Widely fluctuating funding levels hinder effective control which requires annual commitment to a long-term control effort. Existing funding levels do not support an active prevention program, let alone confrontation of the problems on larger acreages already infested.

7. Poor Access - The lack of roads in some areas makes it difficult to safely, economically, and selectively treat existing noxious weeds.

8. Lack of Understanding - of the impacts of noxious weeds by land managers and the general public hinders control efforts. Few people recognize or understand prevention techniques for noxious weeds. Low comprehension of the problem, in turn, generates a lack of commitment to a control program.

9. Public Sentiment - The public has expressed extreme sensitivity to the widespread use of herbicides on both public and private lands. Emphasis should be placed on the fact that individual pesticides differ widely in their character, composition, and potency. Differentiation and recognition of this fact can only be addressed through education, cautious use, and safe application.

B. CONTROL METHODS

1. Prevention - The easiest and least expensive method of control is prevention. Awareness by land managers and the public is the key factor in a successful prevention program. Prevention of the spread of noxious weeds can be accomplished in many ways, including the following:

a. Allow only weed free hay/pellets in the backcountry. Pack all feed inside canvas manties.

b. Keep all livestock off seed infested pastures at least two days prior to entering National Forest.

c. Groom animals to avoid transporting weed seed.

d. Keep vehicles on roadways and avoid cross-country travel. (The extent of weed spread up a particular watershed should be an important consideration when evaluating appropriate travel plan restrictions on proposed and existing Forest roads.)

e. Keep vehicles free of weed parts.

f. Cover weed infested hay when transporting.

g. Discourage use of noxious weeds in floral arrangements.

h. Keep weeds away from waterways.

i. Minimize soil disturbance which could create a seedbed suitable for weed establishment.

j. Seed all disturbed soil to desirable perennial vegetation immediately after the disturbance.

k. Prevent overgrazing.

2. Biological Control - This method of control involves the use of plants, natural insect and pathogenic enemies, and is the most ecologically desirable. It it "nature's way". Due to funding and public concern over herbicides, biological control would be the most desirable control on the Clearwater National Forest. Unfortunately, it may never be completely effective for all species of noxious weeds for the following reasons:

a. It takes several bio-agents to effectively control a weed. Unfortunately, it is very difficult to find several bio-agents from a weed's native environment which are compatable with its new environment.

b. "Nature's way" provides for continuation of all species. Few bio-agents will, therefore, completely destroy their food source and, thereby, themselves.

c. Biological control is a very slow and gradual process. The results are subtle and do not have the "quick fix" appeal preferred by managers and much of the public. It is somewhat contradictory to attempt nature's control measures in environments constantly disrupted and altered by man-induced management activities. Some bio-agents are active on the Clearwater National Forest, but the control they are exerting on their host species is limited at present.

3. Chemical Control - This method of control can provide a "quick fix" and immediately visible result. Followup treatments are frequently necessary, however. Chemical control can be a practical and cost effective tool for certain noxious weed infestations on the Clearwater National Forest. Unit costs are significant and, for that reason, chemical control requires consideration of: the weed species, size of infestation, proximity to additional seed source, topography, location, the extent of weed infestation in a particular watershed, and objective of control and likelihood of success. It should not be applied as a cure all. Chemical control should be considered a

last resort for weed control. Safety and caution are imperative for successful use of herbicides in wildland systems. All applications should be as specific as possible. Aerial spraying is unacceptable due to its lack of application control and likelihood of impacting non-target species.

A successful and accepted spray program requires an integrated approach involving public education on goals and rationale. Shortlived, selective herbicides that break down quickly are preferred over longer-lived soil sterilants to insure an area remains available for multiple use management. Herbicide use is most cost effective and appropriate on the Clearwater National Forest for relatively isolated and small (less than five acres) infestations of weed species. It should be viewed as a backup method to a prevention program. Herbicides are most efficient and effective when used on small infestations to prevent their spread and dominance of an entire site/area.

Recommendations of specific herbicides to be used for each identified noxious weed species are readily available from county extension agents and numerous publications.

4. Mechanical Control - Mechanical control involves the physical removal of the plant. This method of control is marginally cost effective on small (less than one-fourth acre) and recently established infestations. It is generally impractical for two reasons:

a. Most noxious species have deep, extensive, and frequently rhizomous root systems. Removal of the above ground portion does not kill the plant. The weed will frequently resprout. This resprouting is normally more persistent than time or financing allow the puller of the weed to be. It is seldom possible to remove any significant proportion of the root system and to pull 100 percent of the plants in an area (e.g., Leafy Spurge often have roots to 15 foot depths). Use of heavy equipment for mechanical treatment is limited by root systems and topography. Use of plows is not selective and is very difficult on 40 to 60 percent slopes. Mechanical control programs are more effective in the early spring when moist, soft soil allows for maximum root removal. Unfortunately, this is also when the soil is least stable on the Clearwater National Forest and large scale soil disturbance is least desirable.

b. To be effective, the mechanical treatment must be repeated for several years, several times a year. Constant monitoring is necessary to make sure no rhizomes are left alive.

A variation of mechanical control involves the use of livestock to perform the removal. Sheep seem to be the least selective grazers. Eradication is unlikely, however, and control by grazing requires intensive stocking levels for at least three subsequent years of treatment. (Noble, D. L. and D. C. MacIntyre, "Management Program for Leafy Spurge.") Grazing at such intensity can conflict with multiple use. Termination of the removal treatment can result in reinfestation since some noxious species have the capability to store two to three years food supply in their root systems. (Holzer, M. B., "The Spurge Spread.")

Mechanical control is most appropriate on flat and gentle terrain committed to single-use management.

5. Cultural Control - Cultural control involves the application of other natural processes to control a species. Competing vegetation can be encouraged to keep out invasion of weed species. Disturbed sites should be seeded with aggressive and quickly establishing species. Literature suggests that stands dominated by Crested Wheatgrass and Russian Wildrye may be better able to resist invasion of Diffuse Knapweed. (Berube, D. E. and J. H. Myers, "Suppression of Knapweed Invasion by Created Wheatgrass in the Dry Interior of British Columbia.") These studies are not conclusive.

Fire does not appear to be a promising tool for noxious weed control.

Education (of forest users) directed at a cooperative prevention program is a very desirable cultural control measure.

Other cultural control measures, such as crop rotation, mowing to prevent seed production, and others are most useful in agricultural lands due to topography, management objectives, and multiple use. The best cultural control practice is to seed to desirable species after any disturbance since weeds competitive abilities are diminished by a strong, healthy perennial vegetative cover.

C. SUGGESTED CONTROL BY SPECIES

An effective control program should not depend on only one method of control, as each method has limitations. Effective control should, instead, incorporate a combination of several control measures. All control efforts should begin with an education program to inform in-Service personnel and publics of the magnitude and nature of the problem. Preventive measures should be encouraged.

After an ongoing education program is initiated, control/eradication should be directed to existing noxious weed infestations of manageable size. Prior to determining appropriate control method, several factors (characteristics) of the infestation and area should be considered:

1. Control should be watershed by watershed or drainage by drainage to ensure a clean sweep with no reinfestation behind direction of control effect.

2. Control method should vary by species.

3. Control method should vary by species by size of infestation.

4. Control must consider effects/commitment of neighboring landowners.

A two-step prioritization approach could be used. The first step is to control/prevent spread. New and isolated infestations should be highest priority for control. Chemical control is most effective for these new spots. It is imperative that new infestations be killed and not merely stressed or retarded. Followup monitoring should be mandatory. The second thrust should be to contain and control existing noxious weed stands. Determination of control method should consider the practicality/cost effectiveness of the method compared to the likelihood of success.

Some species on the Clearwater National Forest are still at low enough infestation levels that 90 percent control is feasible with appropriate treatment. These are Matgrass, Leafy Spurge, Dalmation Toadflax, Diffuse Knapweed, and Yellow Starthistle. These species should be emphasized to control them before they get out of control.

D. COST OF CONTROL

Cost of control is difficult to quantify due to several variables. These variables include:

1. When control effort is initiated, delay of implementation allows the problem species to further spread, and thereby increase the quantity of problem to be controlled. The longer we wait, the more expensive the solution.

2. Opportunity for successful bio-agent release. Present bio-agents have not been highly successful, but new agents are presently being screened for release. Their likelihood of success is difficult to predict. However, the more bio-agents attack a host plant, the greater is the opportunity for control.

3. The type of control techniques applied. Bio-control agent release has very low unit costs ($1 per acre) where as chemical control can incur unit costs of $25 per acre or more. It must be included, however, that bio-control presently only allows 10 to 15 percent control whereas 90 percent control is possible with chemical control. This element helps put unit costs in proper perspective with effectiveness of control technique.

4. Degree of cooperation/coordination with neighboring landowners. The extent and degree of commitment of neighboring landowners directly affects cost control on the Clearwater National Forest. A lax control program adjacent to Forest land increases our control costs through continual and rapid reinfestation. Interest and participation of neighboring landowners/managers is essential for a cost effective and economical control program.

An estimate of control cost cannot be accurately calculated until specific decisions are made regarding the above variables.

IV. ACTION PLAN

A. Initiate an awareness program to help appropriate Forest Service personnel understand and assess the magnitude of the problem. It should be emphasized that interest and cooperation in the weed program is a very important part of the prevention measures. The awareness program should include, as a minimum:

1. Forest-wide distribution of this noxious weed program proposal.

2. Distribution of noxious weed identification and control publications by University of Idaho Cooperative Extension Service to Districts.

3. District seminars presented by individual county and/or state weed supervisors presenting county noxious weed program proposals.

B. Each District should initiate an inventory, mapping, and monitoring program. Monitoring spread and species presence requires the participation of all field-going District employees. The District should designate a weed coordinator to maintain a map with latest spread and species information. Basic information that could be reported to the coordinator should include, species, location, acreage, and date of observation.

C. The Forest should prepare an Environmental Assessment for the use of herbicides to treat noxious weeds that will satisfy current NEPA regulations. Evaluation of herbicides for the control of noxious weeds should be made by the Forest integrated pest management team. The decision based on that evaluation will then serve as the groundwork for future control efforts.

D. Action by the Clearwater National Forest should be directed first at halting the spread by eradication of new outbreaks and, secondly, a reduction of existing infestations.

E. The cost of any approved spray projects should be reduced by cooperation with county weed supervisors who frequently have the personnel and equipment to perform the job at comparatively reduced rates. Clearwater National Forest personnel should monitor any such operations to ensure compliance with Forest objectives.

F. The Forest should consider requiring only certified and weed-free hay and pellets be allowed in the backcountry of the Clearwater National Forest.

G. The habitat types of the Clearwater National Forest should be hazard rated by noxious weed species. This hazard rating will enable the Forest to better direct control efforts.

H. News releases should be prepared to help educate the public of the situation, consequences, and action (if any) the Clearwater National Forest is proposing. Such releases should stress the Good Host/Good Neighbor policy of cooperation toward common goals.

I. All control efforts should be coordinated with adjacent landowners.

J. Where necessary, development of KV plans should assign high priority to collection of funds for control of weeds spread through road building/maintenance, timber harvest, and related sale activities.

K. All soil and vegetation disturbances should require seeding disturbed soil to desirable species. This should include, but not be limited to, road maintenance and vegetation removal by wildfire.

V. DATA/RESEARCH NEEDS

Additional information is needed on several intangible impacts as described in Section II. Some of the data needs identified in the preparation of this analysis include:

--More information on the impact of competition and allelopathic substances on wildlife browse species.

--Information/quantification of timber productivity loss from weed competition and allelopathic substances.

--Quantification of difference in loss of productivity resulting from noxious weed infestation on open sites versus infestations under the timber canopy.

--Information on potential forage reduction by habitat type.

--Additional and more specific monitoring (mapping) program by species, location, size, and date.

--Information on toxicity effects on wildlife and livestock on the Clearwater National Forest.

--Information on impacts of noxious weed on ground nesting on birds, small mammals, and other non-game species.

VI. PERSONS CONSULTED

In January 1983, an Interdisciplinary Team meeting was held by folks from the Lolo National Forest and the Regional Office to discuss the subject of noxious weeds and develop concerns and suggestions. This team consisted of:

Charles Spoon, Program Officer, Resources, Lolo NF, Team Leader

Homer Bowles, Range/Recreation Specialist, Lolo NF, Report Preparer

Al Christophersen, Forest Silviculturist, Lolo NF

Mike Hillis, Zone Wildlife Biologist, Lolo NF

Larry Timchak, Resource Forester, Missoula RD

Bob Hoverson, Resource Forester, Ninemile RD

Craig Sheehy, Resource Forester, Seeley Lake RD

Bob Krepps, Resource Forester, Plains/Thompson Falls RD

Andrew Kulla, Resource Forester, Superior RD, Report Writer

Billy Hardman, Special Range Project Coordinator, RO

Wendell Hann, Plant Ecologist, RO

Discussion at this meeting generated further literature review and consultation with selected County Extension Agents, Weed Boards, and State Officials.

Resulting from the team meeting is the Situation Analysis Staff Paper, Noxious Weeds On the Lolo National Forest by Charles W. Spoon, Homer R. Bowles, and Andrew Kulla, from which much of the data and information for this report on Clearwater National Forest noxious weeds was attained.

In addition to the ID Team members and authors mentioned the following people orally contributed to the noxious weed reports:

Jim Story, Research Entomologist, Western (Montana) Agriculture Research Center

Roxa French, Range Weed Technician, Montana State University

Willie Huot, Mineral County Extension Agent

Earl Willard, Range Professor, University of Montana

Jim Monfore, Land Use Manager, Weyerhauser Co., Klamath Falls, Oregon

Skip Barndt, Soil Scientist, Lolo NF

Jerry Deibert, West Zone Wildlife Biologist, Lolo NF

Fred Stewart, Forest Economist, Lolo NF

Bob Meuchel, District Ranger, Superior RD

Frank Ehernberger, Superior Zone Engineer, Lolo NF

Ralph Parkins, Fire Behavior Officer/Fuels Specialist, Superior RD

Terri Grotzinger, Wildlife Biologist, Superior RD

Gary O'Keefe, Latah County Weed Control Supervisor, Moscow, Idaho

Robert H. Callihan, Associate Professor of Agronomy, University of Idaho

Richard Old, Plant Science, Graduate Student, University of Idaho

Ken Anderson, Resource Assistant, Clearwater NF

Dennis Griffith, Resource Assistant, Clearwater NF

Wally Murphy, Wildlife Biologist, Clearwater NF

Tom Geouge, Resource Assistant, Clearwater NF

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Appendix O

Insect and Disease

APPENDIX O

INSECT AND DISEASE CONSIDERATIONS FOR THE CLEARWATER NATIONAL FOREST PLAN

by

Scott Tunnock, Entomologist

and

Suzanne Dubreuil, Plant Pathologist

INTRODUCTION

Insects and diseases are natural factors within forest ecosystems and must be considered when formulating plans for management of such systems. Intensity of buildup and subsequent losses caused by insects and diseases can often be directly linked to treatments of forest stands. Before treatments are implemented, forest managers must be cognizant of the potential influences on natural biological balances and impacts. Forest Pest Management can assist in the identification of these problems, provide biological data, and suggest management alternatives where appropriate.

The following insect and disease problems have current or potential effects on management options and decisions within the Clearwater National Forest:

1. Western spruce budworm
2. Douglas-fir tussock moth
3. Larch casebearer
4. Mountain pine beetle
5. Douglas-fir beetle
6. Spruce beetle
7. Fir engraver
8. Seed and cone insects
9. Root diseases:
   a. Armillaria mellea
   b. Phaeolus schweinitzii
   c. Fomes annosus
10. Dwarf mistletoes:
    a. Arceuthobium laricis
    b. A. douglasii
11. White pine blister rust

None of these pests currently affects management policy to the degree of being major concerns in forest planning processes. However, several seriously impact management, especially on a localized basis, and may account for disparity between expected production and actual yields. Each pest is briefly described as to its current status on the Forest, present and potential damage, and possible management strategies for reducing future losses.

WESTERN SPRUCE BUDWORM, CHORISTONEURA OCCIDENTALIS FREE.

Past and Present Status

The first recorded infestation (32,000 acres) was on the Powell Ranger District in 1924. Defoliation continued and spread into the Lochsa, Middle Fork, Musselshell, Elk Summit, Canyon, and Bungalow Ranger Districts until 1934. During this infestation the highest number of acres infested was 75,000 which occurred in 1927 on the Powell District. The next outbreak lasted from 1946 to 1956 on the Powell District and a high of 119,370 acres were defoliated during 1956 (Johnson and Denton 1975). After another 10-year absence, damage started again on the Powell District in 1966 and spread north to the North Fork Clearwater River. The epidemic decreased from a high of 634,830 acres in 1975 to 8,115 acres by 1978. No defoliation was detected in 1979, but 320 acres were mapped in 1980 and less than 175 acres were seen in 1981.

Damage and Impact

Budworm defoliation can cause growth loss, top kill, tree mortality, regeneration failure, cone crop destruction, and can weaken trees enough to make them susceptible to bark beetle attack and root pathogens. In the mixed grand fir type on the Clearwater National Forest, grand fir and subalpine fir are damaged the most, followed by Douglas-fir and spruce. Terminal and lateral shoots of larch are sometimes damaged.

Impact studies have been made on the Clearwater National Forest to determine effects of budworm defoliation. Four areas having heavy defoliation for 3 to 7 years were surveyed to determine radial growth loss in host trees (Franc et al. 1973). Results were:

Area	Years' defoliation	Percent radial growth reduction
Yoosa Creek	3	22
Elk Mountain	3	20
Yoosa Creek	4	31
Hungry Creek	4	22
Squaw Creek	7	44

Trees in Yoosa Creek were remeasured for volume loss in 1974 (Bousfield et al. 1975). Annual growth loss after 5 years of defoliation was 30.89 board feet per acre. Subalpine fir, followed by grand fir, recorded the greatest impact from budworm defoliation.

In 1978, the four areas were remeasured again to assess budworm impact (Bousfield and Franc 1979). Results were:

Area	Percent of stand volume with visible top kill			Percent cubic feet per acre annual loss	Growth loss/acre/year Board feet
	1972	1975	1978	1978	After 6 years
Yoosa Cr.	1.2	7.9	11.1	4.41	46.70
Hungry Cr.	5.1	*	9.1	4.13	10.80
Squaw Cr.	7.8	*	30.1	10.47	34.18
Elk Mtn.	2.0	*	2.3	1.71	43.92

Tree mortality attributed to budworm was minimal (0-.09%) in these four areas.

The effects of budworm damage on height growth was measured in a stand in the Squaw Creek area during 1979 (Bousfield 1980) with the following results:

Tree species	Damage class: Trees with light top kill. 10% crown length		Trees with moderate top kill. 10-33% crown length	
	Feet killed	Years killed	Feet killed	Years killed
Grand fir	8.7	10.5	19.6	25.6
Subalpine fir	5.4	6.9	11.9	15.1
Spruce	9.6	15.4	19.8	31.9
Douglas-fir	0	0	0	0

The most important result is that no top kill was found on Douglas-fir. Hence, this species should be considered in regeneration plantings.

The western spruce budworm is capable of infesting any mixed fir stands on the Clearwater National Forest. Why the old Palouse District, St. Joe National Forest, has never been infested cannot be easily explained. Weather plays an important role in triggering outbreaks, and successive hot, dry springs and early summers seem to favor population buildups. Maybe the Palouse area is consistently too cold and wet from May to July.

Management Strategies and Alternatives

Direct Control Methods

In 1956, 119,370 acres of the Clearwater NF were aerially sprayed with 1.0 pound DDT per acre (Johnson and Denton 1975). No control projects have taken place since then. However, aerial sprays are still an alternative; three chemical insecticides are now registered for the western spruce budworm. They are malathion, carbaryl (Sevin^{r}) and acephate (Orthene^{r}). The microbial insecticide Bt (Bacillus thuringiensis) is also registered, and a few viruses

*** Not examined in 1975.**

also show promise. Aerial spraying is expensive and, besides being biologically and environmentally sound, must be cost effective. Results are not always long lasting and only high value stands that would suffer heavy growth loss would probably be treated.

Silvicultural Methods

Three silvicultural strategies for dealing with budworm are salvage/presalvage, reducing stand vulnerability, and reducing stand susceptibility.

Salvage is the harvest of dead trees and living trees which are damaged beyond the point of recovery before resource values are lost or after some threshold of damage occurs. Since budworm is seldom directly responsible for mortality of merchantable sized trees, salvage volumes per acre are likely to be low with associated high logging costs. Presalvage is the harvest of trees which are expected to die or become damaged beyond the point of recovery. Presalvage is implemented prior to an outbreak or before significant damage is apparent. Salvage and presalvage are suitable only for accessible stands where mortality and severe damage are concentrated. This is a simplistic silvicultural approach to budworm management, and caution should be exercised that stand degradation does not result.

Reducing stand vulnerability will prepare the stand for the next outbreak.

Vulnerability to budworm is a function of stand species composition and/or genetic composition, stand density, stand vigor, and stand size structure.

Host species vary in their ability to cope with defoliation. Grand fir suffers more top kill and radial growth reduction than associated Douglas-fir when subject to repeated budworm defoliation. Damage vulnerability is generally aligned with shade tolerance; it is always the more shade tolerant host species that suffers greater damage in mixed species stands. Two trees of the same species and size adjacent to one another may display different levels of defoliation, suggesting genetic resistance.

Stand density describes the absolute number of trees exposed to budworm feeding. Fewer host trees in the stand result in less damage. Trees in open stands are less defoliated than trees in dense stands.

Tree vigor influences vulnerability to budworm damage. Vigorous trees have more foliage per unit biomass and more carbohydrate root reserves than nonvigorous trees. Nonvigorous trees will have less remaining foliage than vigorous trees resulting in greater growth reduction for nonvigorous trees. Because of additional carbohydrate reserves, vigorous trees retain the ability to produce new foliage and recuperate once defoliation subsides. Vigorous trees are less affected by budworm outbreaks than nonvigorous trees.

Stand size structure is another important factor of vulnerability to damage. Larvae begin to drop on silken threads as food supply grows short in the upper canopy. Host understory receives increased feeding pressure from larvae dropping from the overstory. Understory trees are usually somewhat suppressed nonvigorous trees and tend to have a greater proportion of their foliage in the

current year age class because they are shaded. Loss of this foliage is particularly significant to these trees. Because of their position in the stand and related condition, understory trees are very vulnerable to budworm damage with infested overstories. If crop trees are maintained in overtopped positions, the stand must be considered more vulnerable. To reduce vulnerability, the most vulnerable trees are removed during normal silvicultural treatments. Mixed species composition is favored in regeneration treatments; shade tolerant species are discriminated against. The least defoliated trees are retained in partial cutting, thereby selecting for resistant geno-types. Even-aged systems are preferred over uneven-aged systems. Over-story removal cutting in seed tree and shelterwood systems is done promptly. Stand vigor is maintained by conducting appropriate thinnings. Host trees are harvested at maturity and diseased or otherwise damaged trees are removed.

The third silvicultural strategy addresses the question: How can the habitat of the budworm be manipulated to prevent insect population growth? Habitat factors that are both limiting to population growth and manageable are keys to preventing outbreaks.

Budworm populations are normally held to endemic levels by a complex of natural control factors including weather phenomena, natural enemies (parasites, predators, and pathogens), and the quantity and quality of available food. All too frequently favorable weather coincides with highly susceptible stand conditions and budworm populations expand rapidly, escaping the control of natural enemies. A series of perhaps 2-3 years with warm, dry weather in the spring and early summer is believed to be the climatic trigger for setting off outbreaks. Natural enemies are apparently unable to respond and suppress incipient outbreaks. If weather remains favorable, the epidemic will persist until budworm induces changes in stand conditions and depletes its food supply.

Stand susceptibility, which is both a measure of the probability of infestation and the intensity of attack, is dependent on certain attributes of stands and the stands' orientation to dispersing larvae and adults. Larvae have feeding preferences which presumably reflect their nutritional needs. They don"t like pine foliage and do poorly on other than current year's host foliage. Both species composition and stand density are factors of stand susceptibility because they affect quantity and quality of food.

Stand density and species composition have an important influence on dispersal mortality. More larvae fall to the ground (where mortality is nearly certain) in open stands than in dense stands because trees are spaced further apart, airborne dispersal time is longer, and wind speeds are greater. In mixed species stands, more spring dispersing larvae are likely to encounter a nonhost which leads to starvation. Consequently, dense stands are more susceptible than open stands, and pure host stands are more susceptible than mixed nonhost stands.

Multilayered canopies provide additional feeding sites for dropping larvae, whereas single-storied stands offer a direct pathway to the ground. Uneven-aged stands are most susceptible.

As a stand matures, foliage biomass per acre expands and vigor begins to decline. Both quantity and quality of budworm food would tend to improve as stands grow older. Female budworm moths are known to prefer mature trees with large crowns for egg laying, especially if foliage is exposed to the sun. Both feeding larvae and egg-depositing moths would view mature stands as better habitat than young stands. Since the crown exposure of dominant trees is usually greater in uneven-aged stands than even-aged, attraction to sunlit foliage for egg laying is a factor of susceptibility.

Prioritizing treatments on the basis of susceptibility is a viable approach to management. Removal of mature host trees around the perimeter of plantations will decrease larval dispersal into young stands. Creation of age classes and species composition will assure fewer potential epicenter stands contributing to outbreak developments. No such off-site benefits accrue by prioritizing treatments on a damage basis because the most susceptible stands are not necessarily the most vulnerable to damage.

Simultaneous implementation of all three silvicultural strategies is possible with the degree of emphasis shifting among them according to the rise and fall of budworm epidemics. Prioritizing harvests is reasonable in the face of an ongoing epidemic. Habitat management to prevent large scale outbreaks is good forest management. Coupled with the use of insecticides for selected resource protection, silvicultural strategies are the basis for integrated pest management (Wulf 1981).

Going along with the above philosophies, Carlson (1981) had the following ideas:

1. Reduce the ratio of host/nonhost basal area. In partial cuts, favor the nonhost species.

2. Remove residual host overstory from partial cuts no later than 10 years following establishment of regeneration.

3. For partial cuts, minimize the residual host basal area left either for seed source or shelter.

4. Create a "buffer" by reducing basal area of host species in adjacent stand within 100 meters of the boundary of the adjacent stand.

5. Make cutting units as large as possible, commensurate with other management restrictions.

6. When planting, prescribe a good mix of species, but no more than one-third host seedlings.

7. During stand development, maintain the minimum number of seedlings-per-acre/basal area relative to other management objectives, and maintain a minimum ratio of host/nonhost growing stock (1:3 or 1:4).

These actions, if and when invoked over large enough land bases (sub-compartment, for example), will influence adult and larval western spruce

budworm dispersal, will limit population size, and will significantly reduce present and future western spruce budworm impact on stands managed for fiber production.

DOUGLAS-FIR TUSSOCK MOTH, ORGYIA PSEUDOTSUGATA (McD.)

Past and present status

The most severe outbreaks on the Clearwater National Forest have occurred on the Palouse and Pierce Ranger Districts. Some stands in the Palouse have been aerially sprayed three times. The first recorded damage on the Palouse started in 1944 on Moscow Mountain and in 1945, 320 acres of grand fir were defoliated near Viola. This outbreak became a public issue, and in 1947, 395,535 acres were sprayed with DDT in Clearwater, Latah, and Benewah Counties. In 1955, 30,600 acres had various degrees of defoliation east of Orofino. Damage did not appear again until 1962 when larvae were detected around Orofino and in forested areas on the Palouse District. By 1965, the outbreak had to be controlled, and 120,000 of 225,000 infested acres were sprayed with DDT in Benewah and Latah Counties. Egg masses were found again in 1972 on the Palouse District near Charles Butte, and in 1974, the epidemic became a public issue and 76,534 acres of mixed ownership were sprayed with DDT.

Infested ornamentals or shelterbelt trees are often indicators of outbreak development. Egg masses can be detected in foliage on treetop slash. Pheromone-baited traps are being used to catch male moths in the summer and aid in predicting population trends. Twenty-five or more male moths per trap indicate potential visible defoliation within the next 2 summer seasons (Daterman et al. 1979).

The above history indicated epidemics of the Douglas-fir tussock moth can occur about every 10 years or during every decade on the Clearwater NF. However, they usually last only from 1 to 3 years. No defoliation has been detected since 1974, but male moths were caught in pheromone traps at numerous locations on the Palouse, Pierce, and Lochsa Ranger Districts in 1981. We expect damage to show up in the next few years.

Damage and Impact

Grand fir is the preferred host followed by Douglas-fir and spruce. All other conifers are susceptible during epidemics. Larvae can kill trees in one season. Bousfield and Ward (1976) found 17.6 percent of the Douglas-fir were killed and radial growth was reduced 30.9 percent in a stand on the Nez Perce National Forest.

A large outbreak in the Blue Mountains of Oregon and Washington killed 39 percent of all trees in the heavily defoliated areas. Within these areas were patches where nearly all trees died. Top kill in the heavily defoliated areas amounted to 10 percent of the grand fir and 33 percent of the Douglas-fir (Wickman et al. 1981).

The effects of an epidemic are not always on the negative side. An area on the east side of the Sierra Nevada Mountains in California was severely defoliated

from 1936 to 1938. For 36 years after this damage, radial growth on defoliated white fir trees was significantly greater than that of nondefoliated host trees. The increased growth was probably due to the thinning effect of tree mortality and increased nutrient cycling (Wickman 1980).

The impact of an epidemic on forest recreation in the Blue Mountains was studied. A survey of recreationists, resort owners, packer guides, motel operators, and employees of natural resource agencies revealed little evidence that the tussock moth had significant or widespread influence on recreation in northeastern Oregon (Downing et al. 1977).

Models are available for predicting degree of defoliation, growth loss, top kill, and mortality based on larval populations and amount of defoliation. Trees weakened by heavy defoliation are susceptible to attack by fir engraver beetles, Douglas-fir beetles, and wood borers. Indexes have been plotted for mortality caused by bark beetles (Anon. 1978).

Management Strategies and Alternatives

Past epidemics were treated with chemical insecticides. A management system has been developed that provides methods for predicting damage, weighing effects of different management practices, estimating costs of various treatments, and translating socioeconomic impacts (Campbell and Stark 1980).

Direct Control Methods

Chemical and microbial insecticides are registered and can be integrated with other pest management strategies. Carbaryl (Sevin-4-oil®), Bacillus thuringiensi (a bacterium), and a nucleopolyhedrosis virus are registered for aerial application; methoxychlor naled (Dibrom®) and carbaryl are registered for ground sprays.

Hazard Rating

Outbreaks are cyclic, occurring at about 10-year intervals. The host type covers the Clearwater NF, but not all stands are susceptible. Stoszek (1978) rated high hazard stands based on five variables: (1) physiographic location--defoliation was heavier in stands on ridgetop or upper slope sites, (2) depth of volcanic ash--defoliation decreased as depth of volcanic ash increased, (3) site occupancy--defoliation increased as the ratio of total biomass to site productivity increased, (4) age of host trees--defoliation was not significant in stands with average age less than 50 years, and (5) proportion of grand fir--defoliation increased as the proportion of grand fir in the stand increased. Using these and other variables, stands can be risk rated for defoliation from aerial photographs (Heller and Sader 1980). Kessler et al. (1981) demonstrated this method on the Palouse Ranger District.

Silvicultural Methods

Some stands are very susceptible to outbreaks. Stands and areas of repeated outbreaks should be hazard rated. High hazard stands could be altered through silviculture. The following harvest, regeneration, cultural, and corrective

practices are suggested (Anon. 1978):

1. Refrain from harming or altering soil properties.

2. Harvest cuts (under even-age management systems) should be designed to protect residual stands from heat; desiccating winds; inter-tree competition; drastic changes in temperature, moisture, and light; and physical damage.

3. Favor establishment of tree species adapted to drought (such as ponderosa pine or Douglas-fir habitat types; lodgepole pine, Douglas-fir, and larch on sites capable of supporting true fir species).

4. In mature and overmature stands, harvest-regeneration cuts should be designed to establish seral species to develop new stands dominated by nonhost and less preferred host trees at maturity.

5. Maintain vigorous trees.

Preventive measures are similar to those mentioned for reducing hazard conditions. The following suggestions are for different age structured stands:

1. Thin young seral species stands one or more times to encourage their growth.

2. Harvest and establish seral species in stands composed mostly of host trees.

3. In multistoried stands with a diverse mixture of tree species, age classes, and sizes, improve growth of trees in the intermediate and lower stand levels by felling diseased and decadent trees in the overstory, followed by thinning to favor seral species.

4. Use a multiple thinning approach in pole-sized, dense, even-aged stands composed predominantly of host climax tree species. Remove intermediate, suppressed, and a few codominant trees during the first thinning. Followup treatments should be made at 3- to 5-year intervals to open up the stand gradually. Favor nonhost leave trees.

5. Try prescribed burning to destroy the unwanted understory which would develop into a high hazard stand in mature stands composed of predominantly seral species with a distinct understory of semitolerant and tolerant host seedling-saplings.

Stand Prognosis-Douglas-fir Tussock Moth Model

Land management planners now have an extension of prognosis which incorporates Douglas-fir tussock moth outbreaks into forecasting the future forest. This combined model (Stage 1973; Colbert et al. 1979) will assess the likely consequences of both silvicultural treatments and tussock moth control activities. It should be used in long-term timber management planning because it displays the projected results of alternative strategies for management of

the forests affected by the tussock moth. A user's guide (Monserud and Crookston 1981) is available which explains the use of key words and parameters to simulate tussock moth infestations.

A sample stand from the Palouse RD is shown in figure 1. The 100-year projection displays effects of tussock moth. This particular projection showed that the stand experienced six outbreaks in 100 years. A THINABA 335 was prescribed in 1997 for the stand, but the opportunity was removed because of a tussock moth outbreak in 1988.

Not all stands on the Clearwater will experience tussock moth with the same probability of outbreaks as the Palouse RD; therefore, not all stands would need the tussock moth extension of prognosis.

LARCH CASEBEARER, COLEOPHORA LARICELLA (HBN.)

Past and Present Status

The larch casebearer was discovered around St. Maries, Idaho, in 1957. By 1965, it had spread throughout northern Idaho. Defoliation is still heavy in areas of the Clearwater National Forest, but intensity and size of area defoliated changes from year to year.

Damage and Impact

Defoliation remained very heavy through 1969. Severe branch dieback and tree killing occurred on the Clarkia Ranger District. Damage was so severe that larch management was suspended on the St. Joe National Forest. This amounted to a 97 percent growth reduction (Denton 1979).

Long 1/ studied the impact of defoliation on tree growth and found each larva per 100 spurs (shoots) decreased tree basal area increment by about 30 mm^2/year.

A model has been used to quantify effects of larch casebearer defoliation on growth, development, and dynamics of juvenile mixed species larch stands (Laursen and Moore 1981). In pure stands, simulated defoliation applied during the period of fastest growth resulted in greatest volume losses. In mixed stands, simulated defoliation altered stand development and dynamics which impacted net volume production. Earlier and more intense simulated defoliation caused a net loss of over 468 ft^3/acre of larch volume over 16 years.

After 1969, casebearer populations began to oscillate. Defoliation was heavy in an area for several years, then suddenly decreased. Up to this time, natural control factors did not phase the exploding epidemic. The severe droughts of 1967 and 1968 may have caused populations to decline to low levels. Native parasites and predators began increasing and may have influenced the population decline. Wet springs with freezing periods can cause larval mortality.

1/ Garrel E. Long, Washington State University, Pullman, Washington. Letter of March 10, 1981, to Scott Tunnock, FPM.

Casebearer populations will probably never disappear, but the duration of heavy population cycles will likely be shorter. During population increases, defoliation the following year can be predicted from over-wintering larval and pupal populations in spring (Denton 1979). For instance, 136 to 236 larvae or 81+ pupae per 100 shoots will usually cause heavy defoliation.

Management Strategies and Alternatives

Direct Control Methods

Individual high value stands or groups of larch can be treated with low concentrations of malathion in May.

Biological Control

In 1960, the parasitic wasp Agathis pumila was introduced into the western epidemic. It was well distributed by 1969. From 1972 to date, the following exotic parasites have also been reared and released:

Chrysocharis laricinellae	Dicladocerus westwoodii
Dicladocerus nearcticus	Dicladocerus japonicus
Necremnus metalarus	Elachertus argissa
Diadegma laricinellum	

Chrysocharis laricinellae was the most widespread and abundant of all parasites in 1980. We predict these parasites will decrease insect populations and consider this program the best alternative for casebearer management.

Silvicultural Methods

Denton (1979) measured effects of casebearer on young larch under five different stand densities. In practically all cases, insect populations increased as the stocking density of larch decreased. Pole-sized larch growing in the open or along edges of openings are the most severely damaged.

Casebearer is usually less abundant in areas above 5,000 feet elevation with sudden temperature changes and late frosts. Tunnock (1970) determined that the number of larvae per 100 shoots were higher in the cedar/pachistima and Douglas-fir/ninebark habitat types; the number of larvae per 100 shoots decreased as elevation increased. An elevation of 3,500 feet may be the zone which limits the persistent development of heavy populations. In the 2,000- to 2,500-foot zone, radial increment decreased noticeably after 6 years of heavy casebearer feeding.

MOUNTAIN PINE BEETLE, DENDROCTONUS PONDEROSAE HOPK.

Past and Present Status

Historically, the mountain pine beetle (MPB) has not been much of a problem in ponderosa and lodgepole pine stands on the Clearwater National Forest. Epidemics developed mainly in the old growth western white pine stands.

There are not too many pockets of these old white pines left, but white pines over 10 inches d.b.h. or over 90 years old become susceptible to attack. During 1981, the greatest numbers of attacked white pine were detected around Elk River (27+); along most side drainages off the North Fork Clearwater River; north and south of Elizabeth Creek (40+); within Gravey Creek on the Kelly Creek Ranger District; and on the Powell Ranger District (56+). There were only 10 ponderosa killed on the Powell Ranger District and only 7 on the Lochsa District. No lodgepole pine trees killed by the mountain pine beetle were detected in 1981. However, any areas in the 1910 burn that are regenerated with lodgepole pine will have trees that are attaining ages and diameters conducive to MPB outbreaks.

Damage and Impact

The mountain pine beetle kills its host. It also introduces a blue stain fungus that logging companies claim reduces salvage value. The fungus does not weaken the structural properties of the sapwood. Dead trees may develop cracks after 1 or 2 years.

Since the early 1900's, the MPB has been chronic in the white pine type on the Clearwater NF. Percent kill varies from year to year in any one stand and has ranged from 1 to more than 10 percent in the past. The volume of merchantable, mature white pine will continue to be depleted on the Forest. There is not much data on the impact of the MPB on ponderosa and lodgepole pine stands on the Clearwater NF.

Management Strategies and Alternatives

Direct Control Methods

In the past, efforts were made to control outbreaks by cutting down pines with beetle brood in them and either burning them or spraying the bark with penetrating insecticides. Standing lodgepole were also sprayed with chemicals that would kill brood under the bark. These methods might still work in a small stand of isolated ponderosa or white pine. They were never effective under epidemic conditions in large areas of lodgepole pine.

Green pines in campgrounds and other high value areas can be protected from attack for 1 or 2 years with the insecticide Sevimol-4^{r}. It should be applied in the spring before beetles emerge near the end of June.

For all pine species, under epidemic conditions, the most immediate approach is to salvage-log infested and sound, killed trees. Again, this will not control epidemics. Before epidemics start, high hazard stands should be harvested or managed to prevent or reduce mortality.

Hazard Rating

White pine stands--Trees greater than 90 years old and greater than 10 inches d.b.h. that are diseased or slow growing should be harvested whenever feasible, for they can present a mountain pine beetle problem.

Ponderosa pine stands--Stand conditions usually favorable to and associated with outbreaks are:

1. Species composition--pure or nearly pure ponderosa pine.

2. Stand structure--essentially even-aged.

3. Stand age: 50-100 years.

4. Tree size: 8-12 inches d.b.h.

5. Stand density: stem basal area generally in excess of 150 square feet/acre.

Slow radial growth and small live crown ratios are indicators of high stand density and, consequently, poor vigor. In ponderosa pine stands from the Pacific Northwest, east through the Black Hills, the first outbreaks usually occur in stands between ages 50 and 100 years, and usually in stands developing on a good site rather than on a poor site. A correlation exists between severity of tree killing and stand density. Good quality growing sites support denser stands better than poor sites. It has been found that where beetle-caused tree mortality has occurred, basal area ranged from 140 square feet/acre up to 500 square feet/acre.

Startwell and Dolph (1976) found site quality factors influence which diameter classes are most affected within the stands' range of diameter classes. On class III sites 2/ the mountain pine beetle performed a thinning by killing suppressed and intermediate crown classes. On class IV sites tree mortality was evenly distributed in diameter classes, while tree mortality occurred mainly in larger diameter classes on class V sites.

Based on these findings, it was concluded that intensive competition between trees at high stand densities and its effect on tree resistance to beetle attack constitute a major factor in epidemic tree killing.

Loveless (1981) concluded from his studies in western Montana that tree killing by mountain pine beetle increases as (a) stand age increases, (b) site index increases, and (c) average ponderosa pine d.b.h. increases. The proportion of total tree mortality in a fully stocked stand increases with stand age and site index.

2/ Site class as determined by Meyer's (1938) classification.

Ponderosa pine can be hazard rated using the following criteria:

	Hazard rating		
	1 = low	2 = moderate	3 = high
Stand structure	Multistoried	Two-storied	Single-storied
Average stand d.b.h. (inches)	<6	6-10	>10
Stand density BA ft^2/ac	<80	80-150	>150

Lodgepole pine stands--Mountain pine beetle presents the most serious threat to growing lodgepole pine throughout its range. Populations of the beetle periodically increase, and over the course of an infestation, large diameter trees are usually infested and killed first each year as well as over the life of the infestation. During this period more than 80 percent of the merchantable volume can be killed.

The frequency of epidemics appears to be related to site quality, with stands on more productive sites becoming susceptible more rapidly than those growing on poor sites. The frequency and intensity of outbreaks in lodgepole pine are related to tree age and diameter and elevation-latitude of the stand (Cole and Amman 1980). In general, lodgepole pine stands are high hazard when average stand age is greater than 80 years with an average tree diameter exceeding 8 inches d.b.h. Tree mortality is inversely related to increasing elevation-latitude.

Phloem thickness within trees of a stand determines whether the beetle can maintain or increase its numbers. Because of the strong positive correlation between phloem thickness and tree diameter, and the relative ease with which diameter is measured, average stand diameter is used to determine stand susceptibility. Generally, trees growing on good sites (productivity class 5 = 50-80 cubic ft/ac/yr) will have thicker phloem and when infested a greater brood-to-parent ratio than trees on poorer sites (productivity class 6-7, 20-49 cubic ft/ac/yr) and less than 20 cubic ft/ac/yr respectively.

Stands of lowest density have the greatest proportion of the large diameter trees with thick phloem. Therefore, beetle production will be greater in trees of succeedingly larger diameter classes in more open stands. Mortality in these stands will be proportionately greater than in dense stands.

Intensity of infestations and subsequent numbers of trees killed differ with habitat type (h.t.) (Roe and amman 1970; McGregor 1978). In northwestern Wyoming and southeastern Idaho, the Abies lasiocarpa/Vaccinium scoparium (ABLA/VASC) h.t. contained the least beetle activity--44 percent--and occurred between 6,500-8,500 feet elevation; stands in Abies lasiocarpa/Pachistima myrsinites (ABLA/PHMY) h.t. had the greatest beetle activity--92 percent--and occurred between 6,700-7,800 feet elevation; and within the Pseudotsuga menziesii/Calamagrostis rubescens (PSME/CARU) h.t. showed 65 percent infestation and occurred between 6,000-7,800 feet elevation.

Mortality of lodgepole pine from mountain pine beetle was related to habitat types (Pfister et al. 1977). Losses were found to decrease in the following order--Douglas-fir, spruce, subalpine fir, and lodgepole pine climax (McGregor 1978). There was little difference, however, among Douglas-fir, spruce, and some of the subalpine fir types with mortality ranging from 40 to 42 percent of the lodgepole pine basal area in trees 8 inches d.b.h. and larger. Variation in mortality between habitat types follows what has been previously established; the more favorable the site, the thicker the phloem and consequently the greater the tree mortality provided trees are 80 or more years old.

Some researchers have found that epidemics may not develop even in large diameter, old age lodgepole pine unless current (CAI) and mean annual increment (MAI) intersect, or until there is a rapid decline in CAI.

There appears to be an inverse relationship between tree mortality and incidence of dwarf mistletoe infection. Stands that have the least mistletoe infection suffer the greatest mortality. Because of the beetles' strong preference for large diameter, thick phloem trees, brood production markedly declines in trees heavily infected with mistletoe (McGregor 1978). Roe and Amman (1970) concluded that tree mortality was more severe in relatively mistletoe-free stands and that trees in those stands had thicker phloem than infected trees. Trees having medium to heavy mistletoe infection possess thinner phloem than uninfected trees. Beetle production declines in heavily infected trees.

Stands depleted by the beetle and not subjected to fire are eventually succeeded by more shade tolerant species--Douglas-fir at lower elevations and subalpine fir and Engelmann spruce at higher elevations (Amman 1977). With each beetle infestation, the large, dominant lodgepole pines are killed. After the infestation, both residual lodgepole pine and shade tolerant species increase their growth. When trees are again susceptible, another infestation occurs. This cycle is repeated at 20- to 40-year intervals depending upon tree growth until lodgepole is eliminated from the stand.

Accumulations of dead material resulting from periodic beetle infestations result in very hot fires. Such fires eliminate competitive species, and serotinous cones of lodgepole pine usually seed burned ares abundantly. Following such regeneration, the mountain pine beetle/lodgepole pine interactions would be similar to those described in the absence of fire. Fires may interrupt succession at any time, reverting the stand to pure lodgepole pine.

The cycle is repeated as younger trees reach maturity, are killed, and are replaced. This results in a mosaic of age and size classes in these stands. This may result in more chronic beetle infestations due to a continual source of small susceptible groups of lodgepole pines. Tree mortality may be less per acre during these infestations than occurs in even-aged seral stands.

Amman et al. (1977) used average age and diameter for lodgepole pine greater than 5 inches d.b.h. and elevation-latitude for rating stands. By multiplying risk factors for elevation-latitude by those for average age and average d.b.h.

for trees greater than 5 inches d.b.h. where 1 = low, 2 = moderate, 3 = high, a stand susceptibility classification is obtained. Hazard ratings are 1 to 9, low; 12 to 18, moderate; and 27, high. The following table lists these factors:

Elevation-latitude		Average age LPP (years)		Average d.b.h. (inches) for LPP >5" d.b.h.	
High	(1)	<60	(1)	<7	(1)
Moderate	(2)	60-80	(2)	7-8	(2)
Low	(3)	>80	(3)	>8	(3)

For example, a stand at high elevation (hazard rating 1) more than 80 years old (3) with an average d.b.h. of 9 inches (3) has a hazard rating of 9 (1x3x3 = 9). This is a low hazard rating despite the stand characteristics because of its elevational position. A similar stand at low elevation (3) would have a high hazard rating (3x3x3 = 27). 3/

Silvicultural Methods

Using silvicultural methods to reduce beetle hazard requires an understanding of the beetle, forest, and those factors favorable to outbreak development.

Most beetle outbreaks can be prevented by risk rating stands to identify those of highest hazard and then applying recommended management.

White pine stands--There are no prescribed methods for preventing MPB attacks in white pine stands. Harvesting slow-growing trees over 10 inches d.b.h. whenever possible and thinning areas of white pine will probably reduce tree killing.

Ponderosa pine stands--Forest managers can prevent outbreaks from developing and reduce tree mortality in active infestations by modifying the forest through active commercial and precommercial thinning projects.

Reducing BA below 150 square feet/acre with at least a 16-foot spacing between trees will beetle-proof second growth stands. However, data in Montana shows that the BA should be reduced to 120 square feet/acre or less.

Using today's management guidelines, as exemplified by Meyer's PONYLD growth projections, visualize a site index 70 stand thinned at age 30 from 119 square feet BA to 79 square feet BA with subsequent intermediate cuts to 100 square feet BA at 20-year intervals. This stand will reach a maximum density of 134 square feet BA--still below the 150 square feet BA we consider hazardous at age 90.

3/ One exception to these ranges occurs when all three factors are rated moderate, but the value (8) falls within the range of low risk. This should be considered moderate hazard for beetle potential.

Lodgepole pine stands--Stands where mortality is predicted to occur, or continue at a severe level, can be managed for timber in several ways. These management alternatives are dependent upon land-use objectives and whether stands are pure or mixed species, even- or uneven-aged.

Recognizing that the beetle concentrates on large diameter older trees, continuous forests can be broken up by small clearcuts. This will result in different age and size classes and reduce the amount of area likely to be infested at any one time. When individual stands approach high hazard conditions, they should be harvested. Where composition is pure lodgepole pine and form is even-aged, practices can include (1) stocking control in young stands; (2) organized clearcutting in blocks to create age, size, and species mosaics from mature stands; and (3) salvage cutting to reduce losses in stands under attack. Sanitation salvage cutting should, however, be considered only a delaying action at best. This strategy will do little to eliminate an infestation already underway. For the two former strategies to be of value, current inventory data must be used to identify commercial forest land which is vulnerable but not yet infested; and stands which will attain susceptible size and age within about 15 years.

Many uneven-aged lodgepole pine stands occur as mixed species stands. They contain a mature-to-overmature lodgepole pine overstory and an understory of a mixture of shade-tolerant species and younger lodgepole pine. Another common situation is one or more other species occurring in the overstory with lodgepole pine and climax species in the understory. Mature stands which are uneven-aged or mixed with large lodgepole pine in the overstory can be clearcut as a preventive; or if already infested, losses can be reduced by salvage cutting. Immature stands are candidates for stocking control with species discrimination possible in older mixed species stands.

Discrimination against lodgepole pine is possible in older mixed stands by removing only susceptible lodgepole in a series of partial cuts.

Partial cutting of large diameter trees can reduce infestation potential of susceptible stands. However, partial cuts will be effective where only a small proportion of the trees are in diameter and phloem thickness categories conducive to beetle population buildup and where enough vigorous trees remain to maintain stand productivity (Amman 1976). Maintaining adequate growing stock in such a stand may require a subsidy of development costs.

Susceptible lodgepole pine stands will maintain good productivity when either partially cut or attacked by mountain pine beetle unless the residual stand is less than 50 years old. Beyond that age, periodic annual increment steadily declines for most lodgepole pine in such stands; overstory removal may be better than partial cutting for growth of the understory. Future productivity could be seriously reduced by logging damage, dwarf mistletoe infection, and windthrow--depending on which cutting practices are used. For these reasons, managers should be cautious in the use of partial cutting where maintaining a sustained timber productivity is desired.

Partial cutting can be applied as a last resort salvage of beetle-killed trees. An increased utilization of sound material and a degree of direct

control by removing beetle-preferred trees provide time to accomplish block cutting.

When implementing a partial cut to reduce stand susceptibility, two factors must be carefully considered to avoid doing more damage than mountain pine beetle would:

1. Only those trees that are preferred by the beetle should be removed. Guidelines have been developed by Cole and Cahill (1976) and Amman et al. (1977).

2. Beetles apparently remove from the stand the faster growing genotypes because they have thicker phloem. Consequently, these trees will be removed during a partial cut. Despite the beetle's preference for these trees, they should be regenerated in the stand because they put on volume faster and are the most vigorous. As these trees are removed from the stand, seed should be collected for onsite regeneration.

An additional management alternative for particularly susceptible stands is to favor nonhost trees such as Douglas-fir. Stocking will be reduced less in stands of mixed composition than that in stands of pure host type should an outbreak develop. The beetle infests lodgepole pine in a mixed species stand as readily as in a pure one, but proportion of total stocking affected will be reduced. Conversion to another species may, however, result in depredations by insect pests of that species when those stands mature (McGregor 1978).

DOUGLAS-FIR BEETLE, DENDROCTONUS PSEUDOTSUGAE HOPK.

Past and Present Status

The Douglas-fir beetle (DFB) has always been a threat to commercial stands of Douglas-fir on the Clearwater National Forest. During 1981, seven areas contained groups of infested trees: about 70 trees were attacked north and east of Potlatch; 230 north of Ruby Creek on the Palouse District; about 200 around Elk River: 40 northwest and southeast of Townsaid Butte; 98 on the Canyon District; 30 on the Powell District; and 120 were scattered north of the Middle Fork Clearwater River.

Damage and Impact

Like spruce beetle, the Douglas-fir beetle prefers windthrow or logging slash bigger than 10 inches d.b.h., fire-scorched trees, or trees damaged by ice or snow (Bedard 1950). When this material is not available following a population buildup, beetles will attack vigorous green trees. Usually an infestation in healthy trees lasts only 3 to 5 years.

Beetles attacking standing trees prefer those weakened by drought, root disease, or defoliation over fully vigorous trees. Western spruce budworm or Douglas-fir tussock moth often top kill Douglas-fir and predispose them to beetle attack. There is also an apparent correlation between root diseases and beetle-caused mortality in old growth Douglas-fir. The beetles' success in killing trees is greatest during warm, dry summers. At such times, low-vigor,

moisture-stressed trees are more likely to succumb than vigorous trees on better sites.

The beetle will produce about three times as much brood in windthrow or logs as in standing trees, particularly if the windthrow is shaded. In some timber sales in British Columbia, sufficient debris, stumps, cuttings, and log butts have been left on the ground to produce enough beetles to kill eight large trees per acre. In another area, sufficient slash was left to produce enough beetles to kill 31 trees per acre (LeJune and McMullen 1961).

As populations increase in logging debris or windthrow, a few beetles attack susceptible living host trees, setting up a strong secondary attraction which, in time, attracts more beetles to the area. If weather conditions are favorable, mass attack of initially infested logs or trees occurs. Through attack density is usually higher in living trees, more brood is produced in slash. When the host material becomes saturated with beetles, the population spills into nearby green trees, and an outbreak develops. That behavorial mechanism which induces mass attacks is responsible for the beetles' ability to attack and kill living trees. Sparse beetle population can be maintained in dead or dying host material.

Small numbers of beetles attacking a green tree are usually pitched out.

Management Strategies and Alternatives

Direct Control Methods

Beetle brood under the bark can be killed with chemical insecticides applied to the bark surface of logs or slash, or by burning the infested material. Chemical sprays are not practical under outbreak conditions but may be in campgrounds or other high value areas. Burning logging slash is a good procedure.

Salvage logging of infested trees (especially if entire groups are removed) can reduce tree killing in an area.

There is a synthetic pheromone (nicknamed MCH) that can disrupt mating. In the future this pheromone might be applied by a helicopter to Douglas-fir blowdown to stop beetles from breeding in the down trees.

Hazard Rating

A comprehensive hazard rating system is being developed for Douglas-fir stands. Presently, stand susceptibility classifications are based on characteristics associated with past outbreaks. According to Furniss et al. (1979) stand susceptibility to Douglas-fir beetle is positively correlated with the proportion of Douglas-fir in the stand, its density, and age. Outbreaks are more prone to develop in pure stands with a basal area greater than 238 sq. ft/ac., codominant trees greater than 13 inches d.b.h., greater than 100 years old. Infestations are usually more intense on north and east aspects followed by west, with south aspects being infested the least. In areas surveyed, frequency of infestations were greater at midslope with frequency

decreasing on ridgetops, followed by ravines, and less frequent on benches or flat ground. Mortality was greatest in PSME/PHMA habitat type, then decreasing in each of the following habitat types--PSME/SPBE, PSME/CAGE, PSME/ACGL, PSME/CARU, PSME/SYAL. Tree killing increased with slope steepness, with more mortality occurring in stands on slopes greater than 26°.

While any of these factors can limit amount of damage, high stand density may result in younger trees being attacked. Stand resistance to population expansion increased as (1) susceptible trees are killed or logged, or (2) environmental conditions improve, promoting tree growth. As beetle populations decline, the influence of natural enemies and tree resistance becomes more apparent in maintaining beetle populations as endemic status.

Silvicultural Methods

Preventive measures are most effective and economical in reducing damage. Most outbreaks can be prevented by thinning young stands and maintaining desirable spacing until harvest, removing susceptible material from stands following storms that result in windthrow or snow breakage, and minimizing stand susceptibility to root disease.

Stands should be hazard rated, with logging priority given to susceptible overmature, dense, decadent, and diseased stands. Infested trees resulting from windthrow, wind breakage, top kill by defoliators, or fire damage, and infested logs should be removed prior to beetle emergence (before the spring following attack). Slash and cull log (greater than 8 inches d.b.h.) accumulation should be minimized. Tree-length logging is desirable where practical. Damage to residual trees should be avoided during stand entries.

Prescriptions made for root disease infected stands should minimize both disease and bark beetle damage. Treatments that reduce root disease will reduce future bark beetle losses. If salvaging in such stands, remove trees infested with beetles before their emergence. However, view salvage and sanitation as a short-term approach to recovering volume that would otherwise be lost, and recognize that it may actually increase disease and loss rates.

Remedial: Infestations occasionally develop in standing trees despite precautions. In such cases, the above recommendations should be intensified. Treatments should be emphasized in high hazard stands where mortality may be highest.

SPRUCE BEETLE, DENDROCTONUS RUFIPENNIS (KIRBY)

Past and Present Status

Severe windstorms during 1949 and 1950 provided vast amounts of downed spruce trees for spruce beetle populations to build up in northern Idaho and western Montana. By 1952, an epidemic was underway which lasted into the late 1950's. Areas on the Clearwater that were heavily infested included the "Cedars" (Canyon and Kelly Creek Districts) and Lochsa and Powell Districts (Anon. 1955). A small outbreak occurred around Elk meadows in 1968 on the Powell District, but since then very few spruce have been killed. In 1981, no spruce

beetle infested trees were detected.

Damage and Impact

All known major outbreaks of the spruce beetle originated from stand disturbances. Areas experiencing widely scattered blowdown are conducive to increases in beetle populations. Logging operations resulting in slash accumulations, high stumps, or decked but unremoved logs also initiate population buildups. Where large stands of mature spruce are harvested in successive years, spruce beetle problems are more likely to occur. With proper management serious outbreaks may be prevented.

The spruce beetle prefers downed material to standing trees. The size of a downed tree is less important than the exposure of its bark to sunlight or contact of the bark with the ground--both of which reduce susceptibility. If downed material is unavailable, standing trees may be attacked.

Some statistics from the 1950's epidemic show the potential destructiveness of this beetle (Anon. 1955).

The following tabulation shows volume loss in million board feet during 1954 in infested Districts:

Area	Total infested spruce volume (MM board feet)
Cedars	70.2
Lochsa	20.7
Clearwater	2.1
Powell	70.1

Management Strategies and Alternatives

Direct Control Methods

Infested material with significant beetle populations could be burned, trampled, or removed. Chemical sprays applied to the bark of logs, etc., could be used in small areas such as campgrounds.

The use of trap trees can reduce mortality in managed stands. Trap trees are living merchantable size spruce that are felled to attract beetles; they are effective up to one-fourth mile away. Shaded trap trees sustain more attacks than those exposed to the sun. Unbucked trees are more attractive since branches help shade the bole and hold it above the ground. When held off the ground, the undersides of logs attract more beetles than tops of logs do.

The number of trap trees needed depends on the beetle population and the size of trap trees. A trap tree may absorb 10 times the number of beetles than a similar standing tree does, so the number of traps will be less than the number of standing infested trees. A ratio of 1:10 (trap trees to standing trees) should be used for static infestation, and a ratio of 1:2 for increasing infestations. Infested trees must be removed from the stand before new adult emergence, which occurs 2 years later. This program can be continued until the susceptible stand can be logged.

Hazard Rating

Large diameter standing trees (16+ inches d.b.h.) are preferred to small diameter trees (6-8 inches d.b.h.). Most preferred are those relatively free of live branches on the basal section. These are found growing in a competitive stand where natural pruning occurs. Open growing trees without competition and with live limbs in the basal portion are less susceptible to attack (Schmid and Beckwith 1975).

Spruce susceptibility can be rated more easily and precisely on a stand basis than for individual trees. Knight et al. (1956) outlined the order of susceptibility (in order of decreasing hazard):

1. Stands in creek bottoms.
2. Better stands on benches and high ridges.
3. Poorer stands on benches and high ridges.
4. Mixtures with lodgepole.
5. Stands containing all immature spruce.

Unmanaged stands can be rated by using the average diameter of spruce, basal area, species composition, and physiographic location; these hazard levels are recognized: high, medium, and low (Schmid and Frye 1977). Table 1 illustrates how a stand is rated:

Table 1. Hazard rating of Engelmann spruce for spruce beetle outbreak development.

Hazard category	Physiographic location	Average d.b.h. of live spruce >10" (inches d.b.h.)	Basal area (ft)	Percent spruce in canopy
High	Well-drained sites in creek bottoms; site index >120	≥16	≥150	≥65
Medium	Site index 80 to 120	12-16	100-150	50-65
Low	Site index 40 to 80	<12	<100	<50

During infestations, large, old growth trees containing most of the stand volume are killed. This results in reduced average age of surviving trees, average diameter and height of stand, and spruce component and density. Stand basal area is reduced by 25-40 percent before infestations subside.

Sanitation Methods

The guideline for windthrown trees is to salvage as soon as possible, or after they are infested, before hibernating adult beetles emerge. The exception is where removal encourages further uprooting at the edge of the stand. In some clearcut areas, trees have been windthrown along the edges. Within 1-2 years

after having been removed because of the potential beetle threat, further windthrow occurred. Rapid removal prevented edge trees from developing wind firmness. It might be better to leave windthrown trees, even at the rick of losing a few surrounding trees. An intensive evaluation of the adjacent stand and the beetle population, using the hazard rating system of Schmid and Frye (1977) and the blowdown prediction system of Schmid 4/, would determine whether to salvage or leave windthrown trees.

Precautions should be taken to reduce the possibility of a population buildup in logging residue. Some recommended practices are:

1. Cut trees as low to the ground as possible to reduce stump height, preferably less than 1-1/2 feet.

2. Cull logs and tops should be limbed and branches removed. After limbing, cull logs and tops should be left exposed to full sunlight.

3. Logs and tops should be cut into short lengths--the shorter the better. Complete removal or destruction of all cull logs and tops would eliminate significant host material.

4. If trees are full-length logged, the diameter of the small end should be 3 to 4 inches.

5. Where a substantial spruce beetle population exists in the adjacent forest, it is better to leave logging residues than to remove or destroy them immediately after cutting. Suitable logging residue will attract emerging beetles and reduce infestation of standing trees. Infested residuals must be burned or removed.

Silvicultural Methods

Alexander (1973) suggests several modifications in silvicultural treatments to threatened stands. If spruce beetles are present in low numbers in the stand to be cut, or are present in adjacent stands in sufficient numbers to pose a threat, any attacked and all susceptible trees should be removed in the first cut. This will remove most of the larger spruce and is, therefore, a calculated gamble in above average wind-risk situations. Subsequently, attacked trees should be salvaged.

If more than the recommended percentage of basal area to be removed is in susceptible trees, three options are available:

11 Remove all susceptible trees.

2. Remove recommended basal area in attacked and susceptible trees and accept the risk of future losses.

3. Leave the stand uncut.

4/ Schmid, J. M. 1981. Report in Preparation.

If the stand is left uncut, probably less than half the residual basal area would be lost, but most of the surviving merchantable spruce would be of small diameter.

Though spruce seedlings need only partial shade, full sunlight causes considerable mortality and logging infested trees may reduce the number of established seedlings below minimum stocking. The spruce component will increase in time because of two factors:

1. Even though true fir seedlings vastly outnumber spruce seedlings, the original removal of the canopy by beetles favors the less shade-tolerant spruce more than it does the highly shade-tolerant fir.

2. Animals damage leaders of fir seedlings more readily than those of spruce: therefore, spruce gains valuable height dominance. In the absence of beetles, spruce lives longer, grows larger, and becomes dominant over fir.

FIR ENGRAVER BEETLE, SCOLYTUS VENTRALIS LeCONTE

Past and Present Status and Impact

This is a chronic pest in all grand fir stands on the Clearwater National Forest. It seeks out diseased, injured, defoliated, and slow-growing firs and slash. Drought triggers outbreaks and when epidemics develop, tree killing may continue for 5 to 6 years.

Estimate of killed grand fir during the 1981 aerial detection survey was 993 infested trees on State and private lands within the Clearwater National Forest area. Heaviest concentrations of killed fir were seen in the Palouse area where 855 trees were killed; in the Pierce area 100 trees were killed; and in the Lochsa area 38 trees were killed.

Management Strategies and Alternatives

Hazard Rating

To predict potential outbreak areas, grand fir stands should be hazard rated. Moore et al. (1978) developed a stand hazard index based on stand density or crown competition factor (CCF), and host tree availability as expressed by diversity index (DI). Their assumption is that as stands become denser, competition increases, trees become less vigorous, and larger trees are stressed which increases their susceptibility. Also, pure grand fir stands are more prone to attack. Data required to derive CCF and DI can be collected during standard timber inventories (tree species, d.b.h., and number of trees occurring on a fixed or variable radius plot).

Mahoney et al. (1979) also found that the presence or absence of certain understory plant species or species groups could indicate site conditions favorable or unfavorable to high mortality caused by the fir engraver. They found that Holodiscus discolor, Carex deweyana. Arenaria macrophylla, and Saturega douglasii are indications of areas where S. ventralis will cause little mortality of grand fir. Where Clintonia uniflora and Chimaphila

unbellata occur, mortality will be more extensive.

Prevention

Destroying brood by chemical sprays or cutting and burning infested trees is not practical under forest conditions. Salvage logging of infested trees and treating green or infested slash by trampling, lopping, and burning will reduce beetle populations in an area. Some grand fir resist attacks by fir engravers by phloem resinosis. These resistant trees should be left as seed trees. The best indicator of resistant trees is streamers of clear pitch exuding from entrance holes.

A good correlation exists between fir engraver beetle attack and root-diseased grand fir in northern Idaho. Weakened trees maintain endemic fir engraver populations.

Control of defoliating insects, reducing the number of grand fir trees in a stand, replacing grand fir with Douglas-fir, larch, and ponderosa pine, removal of decadent trees, and other silvicultural practices aimed at maintaining healthy stand conditions will minimize fir engraver attacks.

CONE AND SEED INSECTS

Many species of insects damage cone and seed crops. Their impacts are particularly significant in areas managed for regeneration purposes such as seed production areas (SPA'S) and seed orchards. This group of insects should be considered in the management plans of the Forest's SPA'S and seed orchards.

Some survey information obtained on the Panhandle National Forests about the impact of cone and seed insect injury is applicable to the Clearwater NF:

During 1978, 1979, and 1980, four SPA'S (Cathedral Peak, Halfway Peak, Kelly Mountain, and Spyglass Peak) and two seed orchards (Sandpoint and Lone Mountain) were surveyed for cone and seed insect injury. Very little damage occurred to the cones of lodgepole pine, western hemlock, Engelmann spruce, and subalpine fir. Douglas-fir cones were severely damaged, especially at Kelly Mountain where the entire cone crop was nearly destroyed by cone worms, cone moths, and midges in 1978. White pine cones are often heavily damaged by the mountain pine cone beetle; its impact can be extreme in seed orchards managed for blister rust resistant seed. As many as 65 percent of the cones at the Sandpoint seed orchard have been destroyed by this beetle during some years.

Generally, light cone crops are heavily infested with insects and heavy cone crops have a much lower percentage of the cones destroyed. Emphasis should be given to cone harvesting during years of good crops. Chemical insecticides are registered for management of some cone and seed insects. Because treatment success is so dependent upon accurate identification of the pest, selection of the correct pesticide, and proper timing of application, Forest Pest Management specialists should be deeply involved in all spray projects.

ROOT DISEASE

Root disease is a condition of the site. It can be as site-limiting as soil and climatic factors. Stand success may depend on detecting root disease and managing appropriately.

Major causes of root disease on the Clearwater National Forest are Armillaria mellea Vahl. ex Fr., Phaeolus (Polyporus) schweinitzii (Fr.) Pat. and Fomes annosus Cke. These fungi live saprophytically in large roots and stumps of dead trees for perhaps 50 years or more. In root disease centers pathogens move independently through soil or are transmitted through root contact. Although scattered and small group root disease mortality may involve more trees forest-wide than do root disease centers, we have little information on the mode of pathogen spread causing scattered and small group mortality.

Root disease centers enlarge slowly at an average rate of about 1 foot per year (Shaw et al. 1976) (Wallis and Reynolds 1965). As trees are killed at the perimeter, they are replaced by reproduction from susceptible trees surrounding the root disease center, thus perpetuating the disease. Conditions created by this process are often conducive to vigorous browse growth and resulting support for wildlife. Such considerations may be important on lands where timber is not the primary resource.

Damages

Mortality is the greatest source of loss to root disease. Bark beetles often attack root-diseased trees. Recurring mortality in infested sites may result in severely limited or lacking site productivity. This condition may be overlooked because although the eventual death of all susceptible trees will preclude marketable crop production, the site may appear always fully stocked with regeneration (Shaw et al. 1976).

Growth loss is probably a relatively small part of total root disease losses. No measurements of growth loss due to root disease in the Northern Region have been made. However, coastal Douglas-fir infected with Armillaria root rot (Armillaria mellea) have shown radial increment losses of 20 percent annually in the first 10-20 years before death (Shaw and Toes 1977). Windthrow associated with rotted roots is occasional and locally significant, but accounts for much less volume than direct mortality from root disease. Butt decay by root disease fungi can result in considerable cull, especially if P. schweinitzii is involved. However, volume losses are only locally high in most cases and generally lower compared with that due to other heart rots.

Losses to be Recovered Through Management

On the Clearwater National Forest 9.5 million trees are dead accounting for 245 million cubic feet of wood (Stewart and James 1982). This is an accumulation of mortality over an unknown period; only standing trees were counted. Thirty-five percent is known to be root disease mortality, a very conservative estimate due to difficulties in detecting root disease. Volume and acreage estimates from 1981 survey results will be available. Root disease is,

therefore, an important consideration for forest management on the Clearwater National Forest.

While averaging 7 cubic feet per acre forest-wide, root disease losses vary greatly among stands. For effective management, root disease first must be detected. If present, it should be surveyed stand-by-stand to show intensity and distribution (Filip 1980) (Bloomberg et al. 1980). Portions of stands requiring root disease suppression can be identified in this way so effort can be concentrated where it is most needed.

Root disease impact may be increasing in some managed stands. Root disease intensification may be caused by partial cutting or thinning. For example, partial cutting in the Middle Canyon Study Area, Lochsa Ranger Station, probably intensified mortality in the remainder of the stand. A cedar root rot problem in two locations on the Clearwater National Forest (Waldie Study Area, Lochsa RD, and Sourdough Creek, Canyon RD) also may have been caused by partial cutting 10-15 years earlier.

Infested stands on the Bitterroot and Lolo National Forests that had been precommercially thinned experienced near-total loss of productivity due to Armillaria root rot. Salvage cutting on the Flathead Indian Reservation was found responsible for increases in mortality rates in remaining trees (Dubreuil et al. 1982).

No conclusive research is available regarding the relationship between partial cutting or thinning and root disease intensification in the Northern Region and none is likely to be forthcoming. Therefore, these observations should be approached with caution but with awareness of their possible implications.

Rehabilitation of root disease infested sites provides gains which may extend over several rotations. This should be a consideration in deciding whether to undertake a root disease suppression project.

Management

Management must take into account that root disease is a problem of the site and that removal of infected individuals does little or nothing to improve infested sites. Generally, stand conversion to less susceptible species (Table 2) is the most promising control method. However, the handling of other management procedures can greatly influence the course of root disease infestation. The nature or pattern of root disease development varies with the site; each infested site should be considered and managed individually.

Table 2.--Relative susceptibility of selected conifer species to major root pathogens on the Clearwater National Forest. 1/

Pathogen	Tree species 2/		
	Most susceptible	Less susceptible	Resistant
Armillaria mellea	DF, GF, SAF, PP, LPP 3/	WWP, WH	WL, WRC
Phaeolus schweinitzii	DF, WL, GS, SAF, PP, WH	LPP, WWP	WRC
Fomes annosus	SAF, GF, PP, WH	DF, WWP, LPP, WRC	WL

1/ Most of the susceptibility ratings are based on field observations rather than experimental data (Filip and Schmitt 1979).

2/ DF = Douglas-fir
GF = grand fir
LPP = lodgepole pine
PP = ponderosa pine
SAF = subalpine fir
WH = western hemlock
WRC = western redcedar

3/ Although all these species are about equally susceptible to Armillaria they are often not affected in the same disease centers, i.e., ponderosa pine are usually not killed in Armillaria centers where Douglas-fir and grand fir are killed.

Silvicultural Methods

Salvaging trees killed by root disease may reduce losses but may increase mortality rates in leave trees. Salvage may best be used within a few years of a total harvest where mortality rate acceleration does not have sufficient time to cause significant losses. If frequent reentry is practicable salvage may also be a useful means of reducing loss.

Precommercial and commercial thinning are most effective in reducing loss if resistant species are favored. Depending on the cause, amount, and distribution of root disease, the improvement of susceptible tree vigor through thinning may be an effective damage control. Thinning at an early age may reduce inoculum buildup by reducing stump size.

Where root disease is so severe as to make stands nonproductive, as is often the case with large root disease centers, the existing vegetation (stands) may have to be removed and replaced with resistant species.

When stands with restrictively high rates of root disease are harvested they should be regenerated with resistant species. This may be accomplished using seed trees or by artificial regeneration.

Genetic resistance to root disease pathogens probably exists within populations of susceptible species. This aspect of control is under consideration for research by the Forest Service.

Direct Methods

Control strips of various construction surrounding root disease centers have been tested with varying degrees of success (Byler and James 1981), (Redfern 1968), (Sokolov 1964). Strips two or more chains (132 feet) wide in which all stumps are uprooted are probably most effective (Wallis 1976). Other types have utilized killing trees around a root disease center boundary or leaving a band of live trees around the boundary.

All three methods are aimed at checking radial spread of the pathogen. None has been adequately tested and success depends greatly on proper diagnosis of causal organisms and accurate estimation of infection extent in the stand surrounding a center.

Stumping (uprooting all stumps) in root disease centers has been effective in controlling root disease (Wallis 1976), (Morrison 1981); however, it is expensive, not practicable on some sites, and unproven in Region 1.

DWARF MISTLETOE

Three species of dwarf mistletoe cause damage on the Clearwater National Forest: Arceuthobium laricis (Piper) St. John on western larch, A. douglasii Engelm. on Douglas-fir and A. americanum Nutt. ex Engel. on lodgepole pine.

Damage is growth loss, tree deformation, wood degrade and mortality. Growth loss is the most significant effect. Infections on western larch and lodgepole pine are almost exclusively localized in branches or small portions of boles causing relatively little deformity or wood degrade. Douglas-firs almost always develop systemic infections which can cause severe deformity and considerable loss in strength and fiber quality of wood. Early death of severely infected individuals may be due mostly to predisposition of dwarf mistletoe-stressed trees to bark beetle attack. Mortality associated with dwarf mistletoe infections is infrequent in the Northern Region.

Losses

Based on a sample of 643 trees on the Clearwater National Forest, 54.5 percent of western larch, 8.4 percent of lodgepole pine and 0.3 percent of Douglas-fir are infected. Growth and volume loss figures are presented in Table 3. Total volume loss forest-wide is estimated to be 391 M cubic feet per year. Actual losses vary greatly among stands due to differences in infection levels and tree growing conditions. Heavily infested, slow-growing, overstocked stands are most affected.

Table 3.--Growth loss caused by dwarf mistletoes on the Clearwater National Forest.

Species	Commercial forest (M acres)	Infested %	Infested M acres	Growth loss ft. 3/ac/yr.	Volume loss M ft. 3/yr.
Western larch	16.3	54.5	8.88	20	178
Lodgepole pine	197.4	8.4	16.35	12	196
Douglas-fir	286.6	.3	0.83	20	17
Total					391

Good Candidates For Control

Dwarf mistletoes are readily controlled silviculturally. They are obligate parasites--they die with their host. They have long life cycles; it takes 4-6 years from infection to seed production. They spread very slowly through a stand an average of about 1-2 feet per year. They are easily detected in infested stands. They are generally host specific; the few infections established on nonprimary hosts are usually of little or no consequence.

The only exception is larch dwarf mistletoe (A.laricis) crossover to lodgepole pine. In localized areas this can be quite significant and cause considerable damage. However, lodgepole pine dwarf mistletoe (A.americanum) will not infect western larch.

Management

Present distribution of dwarf mistletoes is directly related to fire history (fire eradicates dwarf mistletoe). Therefore, dwarf mistletoe infested stands are spotty with locally heavy infestations. Therefore, management of dwarf mistletoes is planned and conducted on a stand-by-stand basis. Dwarf mistletoe either can be eradicated or reduced to significant levels in a stand. Losses to dwarf mistletoes in many stands are so low that control measures are not justified.

Losses should be evaluated before management plans are developed. Stand exams or special surveys, both utilizing Hawksworth's 6-class rating system (Hawksworth 1977) can provide the necessary information. Stands requiring special rehabilitation should be identified. Dwarf mistletoe suppression funds are usually available through Forest Pest Management for such situations.

Management Systems

Eradication: Clearcutting is the simplest way to eradicate dwarf mistletoes. Sites must be sanitized following clearcutting; that is, all trees must be removed.

Seed tree silvicultural systems can be nearly as effective as clearcutting if overstory trees are removed shortly after regeneration is established.